State of DePIN
2024

State of DePIN: About the Authors

Salvador Gala

Sal is co-founder of Escape Velocity Crypto (EV3), a DePIN-focused investment firm with $50m AUM.

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Dylan Bane

Dylan is the lead DePIN analyst at Messari, a crypto-native research & analytics platform.

Messari

@dylangbane

For past reports, see State of DePIN 2022 and 2023.

State of DePIN: Index

Index

Disclaimers

About EV3: $50m AUM DePIN-focused investment firm launched in 2022.

Research

The Next Frontier in Cloud Computing: Decentralization as a Catalyst for Disruption, by **EV3 & Franklin Templeton Digital Assets**

Helium: Crowdsourcing a National Telecom Network, by **EV3 & Harvard Business School professor Jorge Tamayo**

Disrupting Real World Infrastructure Onchain, by **EV3 & Fidelity Center for Applied Technology**

Firm Overview

Salvador Gala
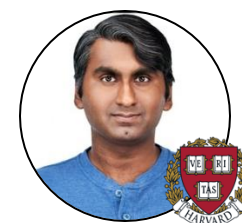
Mahesh Ramakrishnan

EV3 Ventures
Pre-seed & seed DePIN projects

EV3 Liquids
Liquid DePIN tokens

What is DePIN?

DePIN = Decentralized Physical Infrastructure Networks.

DePINs use crypto-incentives to efficiently coordinate the **buildout & operation of critical infrastructure** on top of public blockchains.

DePIN Sectors

Wireless	Energy	Compute
Sensors	Logistics	Identity

Public Blockchains

DePIN Timeline

1st **Storage** networks — 2014
1st **Compute** networks — 2017
1st **Wireless** networks — 2019
1st **AI** networks — 2020

1st **Storage** networks — 2021
1st **Agent** networks — 2022
1st **Energy** networks — 2023
1st **AR/XR** networks — 2024

1st **DePIN VC** fund — EV

Messari
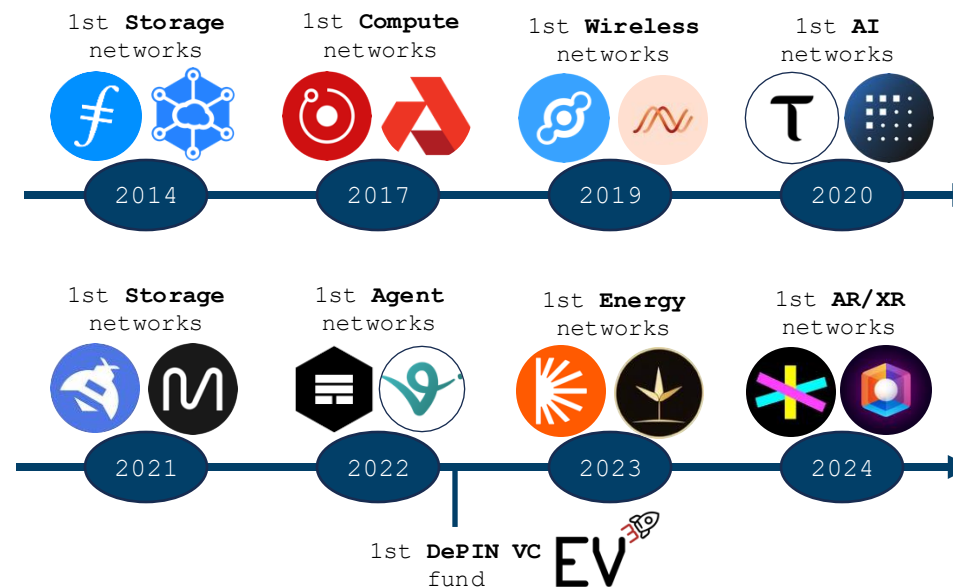
DePIN <u>empowers & incentivizes</u> people to improve public infrastructure around them.

In a world full of untrustworthy institutions & incompetent bureaucrats,
DePIN transfers wealth & power back to citizens & communities.

Digital maps
Energy grid
AI
Telcos
Datacenters
Power plants
Carbon credits

Home internet
Food delivery
Knowledge work
Ride-sharing
Advertising
Mobility
Health & fitness
Pets & livestock

DePIN is how the <u>majority of humanity will</u> onboard onto the crypto economy.

The first 500 million crypto owners won the genetic lottery: they were lucky enough to *buy* their first crypto… **the next 5B crypto owners will *earn* their first crypto.**

<u>Wealth</u> Distribution

To date, global crypto ownership (ex-stablecoins) has been concentrated in wealthy countries, where consumers have disposable income & a high-risk tolerance for their capital.
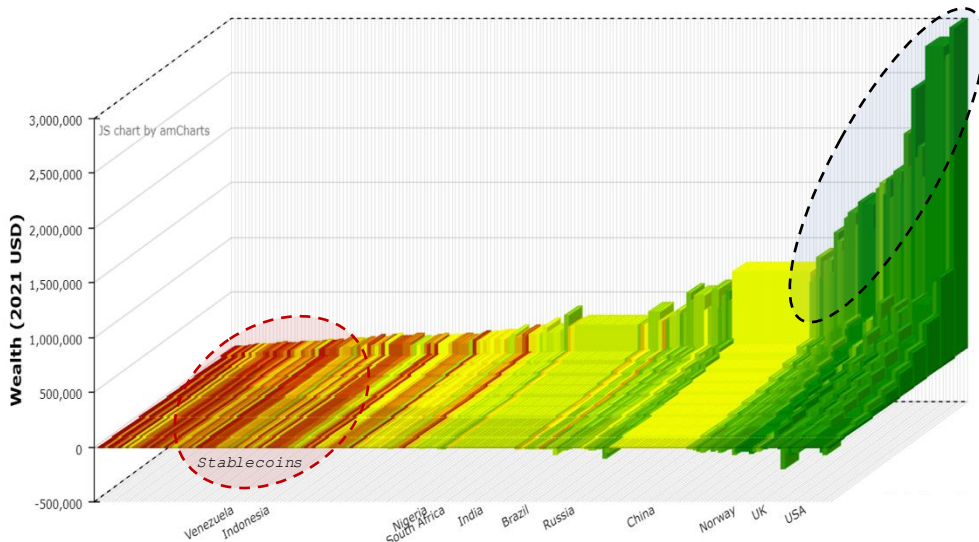
<u>Capability</u> Distribution

Unlike the massive power law in global wealth distribution, humans' time, intelligence and physical capabilities are either uniformly or normally distributed.
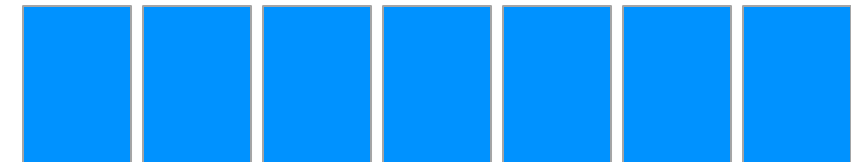
Time is uniformly distributed – everyone gets 24 hours per day.
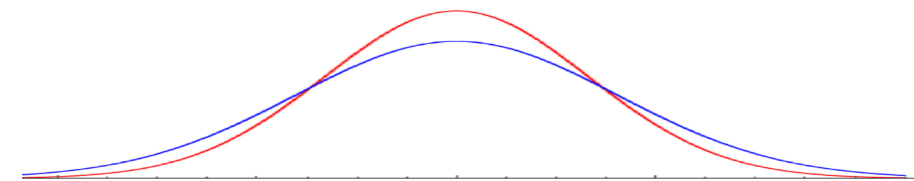
Intelligence is ~normally distributed (IQ).

🐚Messari

DePIN is AGI reaching back in time to create the resources it needs to thrive.

Generating a 5-second video today **costs >$0.10 in compute, electricity & bandwidth**... advanced AIs will demand these digital commodities at an unimaginable scale.

What does it take to generate a 5-second video?

1,500 TFLOPs
Compute
~$0.01

240 TB
Data
???

3 MB
Bandwidth
~$0.01

0.4 kWh
Electricity
~$0.08

Video generated by **prodia**

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DePIN is the first <u>triple-point business model</u> capable of spawning $10T+ networks.

DePIN Flywheels combine the economies of scale of traditional infrastructure (1), with the network effects of a tech platform (2), and the liquidity moats of a currency (3).

DePIN Flywheel

1 *Infrastructure Economies of Scale*

3 *Currency Liquidity Moats*

2 *Marketplace Network Effects*
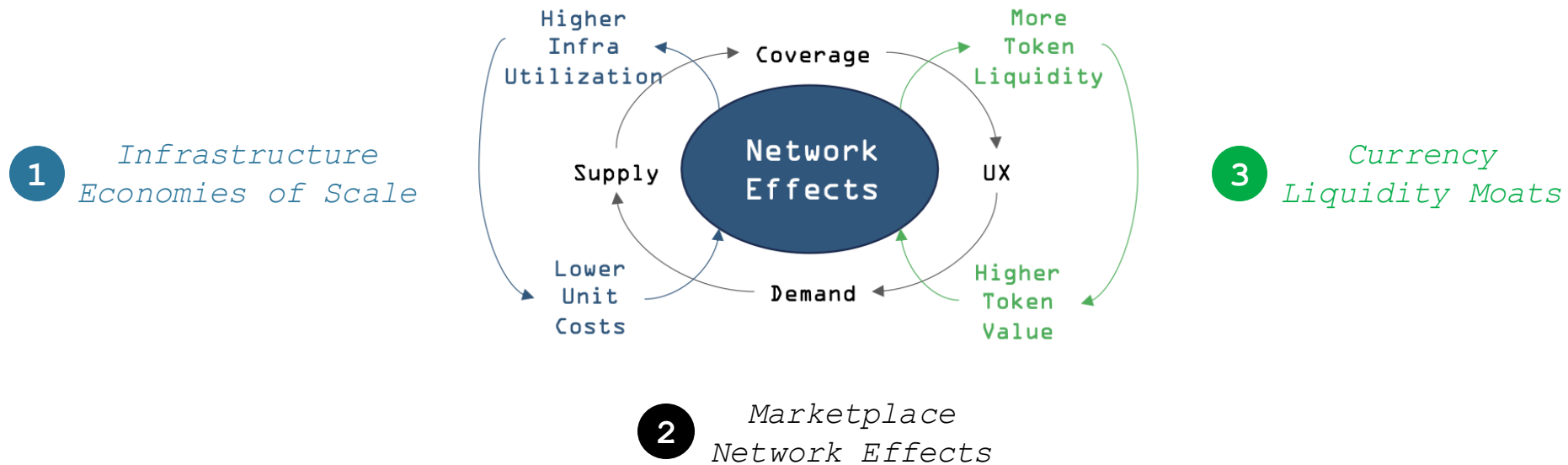
DePIN is in its <u>earliest innings</u> with <0.1% market share of $1T+ end-markets.
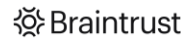
DePIN will grow **100-1000x over the next decade** as networks win market share from centralized corporations with slower, less reliable and less dynamic offerings.

Global Market Share of DePIN Leaders

Wireless		Compute		Energy		Identity	
7.2 billion cell phone plans	**1.6 billion** broadband plans	**75 zettabytes** cloud data storage	**500K H-100** GPUs owned by hyper-scalers	**350 GWh** energy storage capacity	**300 million/yr** carbon credit issuance	**8 billion** human identities	**1 billion** pet identities
0.002%	0.001%	0.001%	0.03%	0.001%	0.001%	0.2%	0.1%
helium	DAWN	Filecoin	IO.NET	Daylight	Glow	WORLDCOIN	Anymal

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With $50B of market cap across 350 tokens, the DePIN sector trades at ~100x ARR.

We classify **six categories of DePIN** based on the core *job-to-be-done* of each network: compute, wireless, sensors, identity, energy & logistics.

	Job-to-be-Done	# of Projects	# of Tokens	Market Cap	Revenue Multiple	Category Leaders
Compute	**Store** and **manipulate** data	750	245	$40B	85x	Render, Virtual Protocol, bittensor
Wireless	**Move** data between locations	135	30	$4B	1,350x	helium, DAWN
Sensors	**Capture** data	145	35	$3B	730x	hivemapper, GEODNET
Identity	**Capture** identity & reputation	45	15	$3B	900x	WORLDCOIN, Braintrust
Energy	**Generate** and **store** electricity	65	15	<$0.5B	25x	Glow, Daylight
Logistics	**Move** physical assets between locations	30	10	<$0.5B	--	nosh, Teleport
Total		**1,170**	**350**	**$50B**	**100x**	

What Changed in DePIN in 2024?

Crypto doubled in 2024; <u>DePIN grew even faster</u> as AI dominated the world's attention.

DePIN went from being a non-consensus category to being widely-recognized as one of, if not the **single most important sector advancing the crypto economy today**.

DePIN
Projects

+12x → 1,170

650

<100

2022   2023   2024

DePIN
Market Cap

% of Crypto Alts:[1]

2%   4%   5%

+10x → $50

$20

<$5

2022   2023   2024

DePIN
Revenue

+100x → $500

$350

$100

$50

<$5 $15

2022   2023   2024
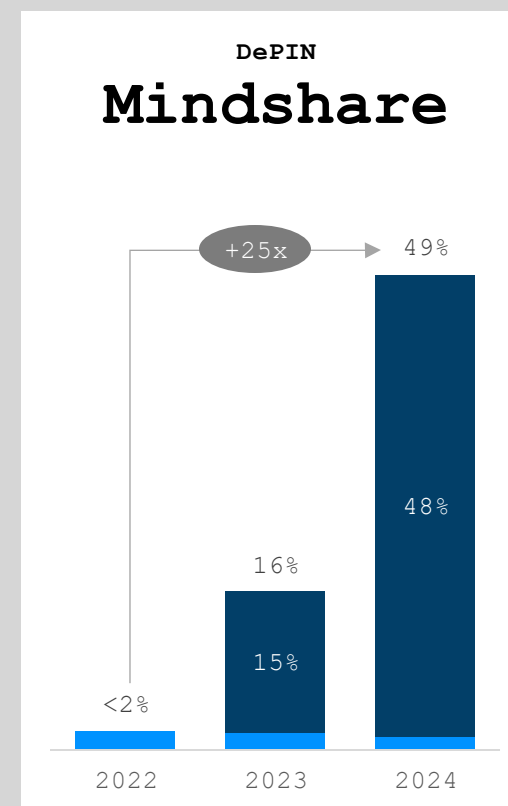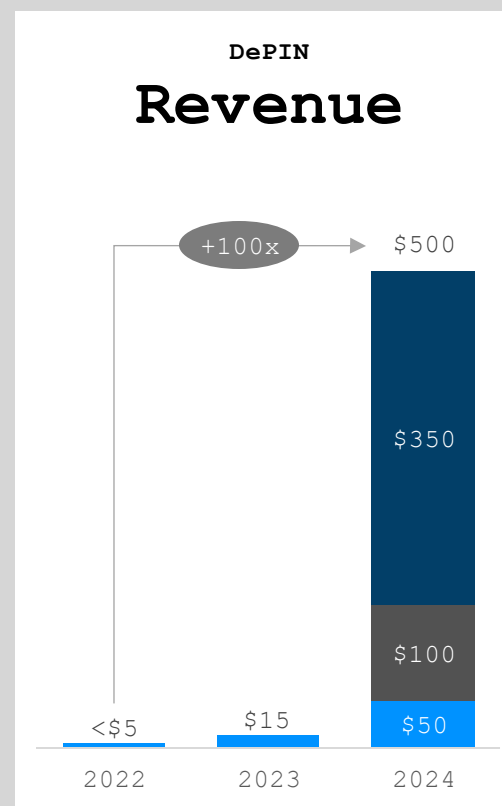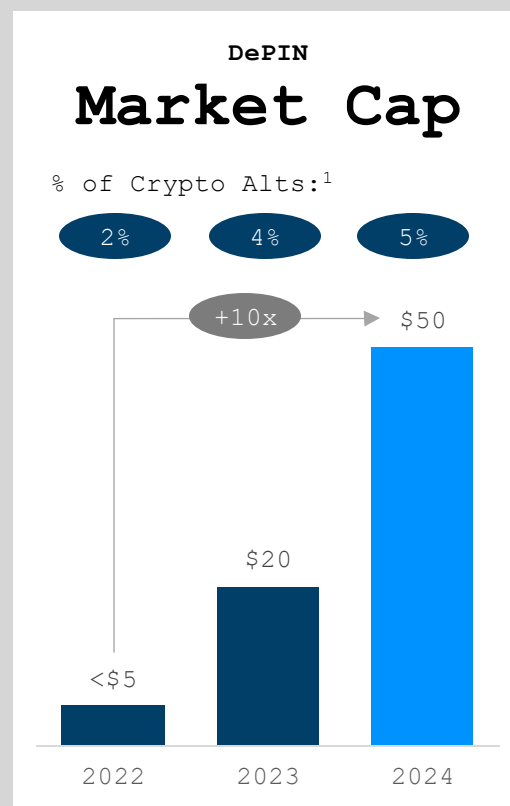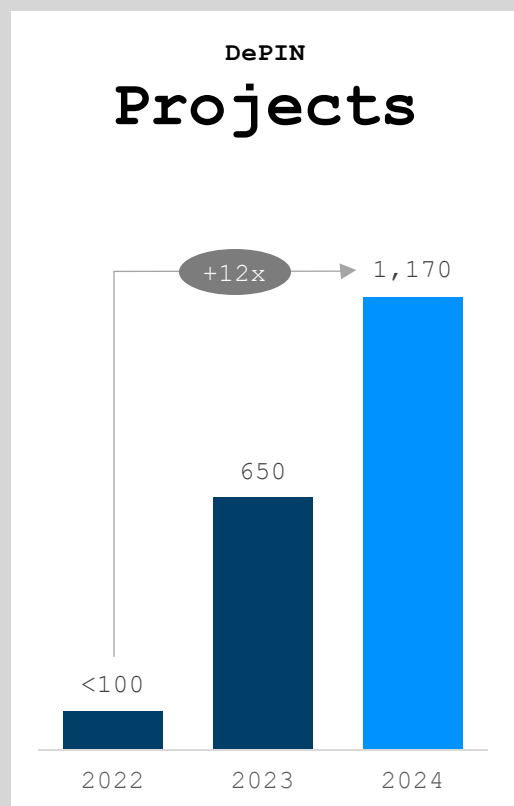
■ Onchain   ■ Offchain   ■ AI

DePIN
Mindshare

+25x → 49%

48%

16%

15%

<2%

2022   2023   2024

■ DePIN ex-AI   ■ AI

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DePIN's growth was powered by new DePIN-native platforms for founders & communities.

DePIN Snacks, Summit & Ninja are sponsored by polygon
Click here to apply to Polygon's 1B POL community grants program.

Podcasts	News	Analytics	Events	Advisory
BUILDING IN PUBLIC	EV3	ev3	DEPIN SUMMIT	Proof of Coverage
70+ DePIN founder interviews	1 DePIN startup idea each week	Tracking 1500+ DePINs	Annual invite-only conference	GTM and TGE consulting
Subscribe	**Subscribe**	**Visit**	**Register**	**Contact**
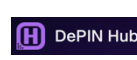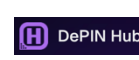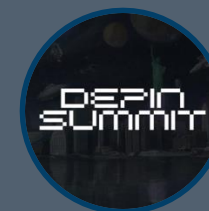
We are DePIN | DePIN Hub Podcast Bringing web3 to the masses | UNLEASHING DEPIN

DePIN WAVE | DePIN Hub | Today in DePIN

DePINscan | DePIN Hub

R3al World Summit 2024 | de:pin day | DEPIN 2049

GOLD HAWKS
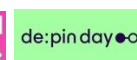
DePIN nerd-sniped some of the brightest minds in crypto.

At the **2nd-ever DePIN Summit in NYC,** the sector's leading founders & investors came together to collaborate on the future of community-operated infrastructure networks.

Investors & L1s

Why Verification Matters in DePIN — a16zcrypto

New Map Unlocked: Compounding Demand-Side Growth — Multicoin Capital

DePIN's Path to Series A — ParaFi >|< DRAGONFLY

Domino Effect: Global Information Flows — frictionless capital

Building New Commodity Markets — Ostium CRUCIBLE

Dispelling the Bittensor FUD — CRUCIBLE LABS

The Future of DePIN on Move — Movement archetype ventures

DePIN's Onchain Summer — BASE

DePIN on Polygon — polygon

DePIN Modularity in Action — IoTeX

DePIN Founders

Vampir—Attacking Web2 Marketplaces with zkTLS — Opacity

DePIN's Vision for Wireless — DAWN

Stripe, Shopify & 3DOS: Next-Gen Ecommerce — 3DOS

New Shapes & Structures in the Solar Economy — Glow

AI Apps that *Actually* Make Money — prodia Olas 375ai

Bringing Pet Identities Onchain — Anymal

A New Era of Wireless Connectivity — OXIO

The Last $1T+ DePIN Category: Logistics — HEALE

The Best Framework for DePIN Apps — DePHY

Source: DePIN Summit.

Messari

Scaling supply-side is no longer a mystery: clear growth playbooks have emerged.

Most DePINs combine **light nodes** for low onboarding friction & new user acquisition with **heavy nodes** for stronger and more reliable network performance.

Easier to onboard new nodes

Hosted Nodes	Browser Extensions	Mobile Apps	Desktop Apps	Dedicated Hardware	Enterprise / Fleets
Users pay an up-front node license fee & earn mining rewards over time.	DePINs tap into browser resources like bandwidth and edge compute.	DePINs tap into smartphone sensor data and computing resources.	DePINs tap into CPU/GPU/RAM & bandwidth from users' laptops.	DePINs sell custom and/or off-the-shelf hardware devices to users.	DePINs work with enterprise fleets to deploy devices at scale.
Centralization: users don't control their nodes.	**Low reliability:** active tabs get prioritized first.	**Low flexibility:** hamstrung by app store rules.	**Low conversion:** users hesitant to run executables.	**Complexity:** managing hardware supply chains.	**Dependencies:** on long enterprise sales cycles.
Notable Examples	Notable Examples	Notable Examples	Notable Examples	Notable Examples	Notable Examples

Trade-offs:

More powerful node capabilities

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More than <u>13 million devices</u> globally contribute to DePINs every single day.

Twenty DePINs grew to >100k active nodes in 2024, five of which are now above 1m nodes.

Active Nodes (millions)

| grass: 2.5 | DAWN: 2.3 | WiFi Map: 1.3 | Room: 1.0 | Gradient: 1.0 | UPROCK: 0.9 | helium: 0.8 | NETWORK3: 0.6 | WORLD MOBILE: 0.6 | Titan Network: 0.5 | Aethir: 0.4 | IO.NET: 0.3 | AiGO: 0.3 | AIOZ: 0.2 | NATIX Network: 0.2 | POWERPOD: 0.2 | hivemapper: 0.2 | DIMO: 0.1 | Nodle: 0.1 | Koii: 0.1 | hyperspace: 0.05 | Dabba: 0.05 | Ethernity Cloud: 0.04 | DATS: 0.04 | PHALA NETWORK: 0.03 | akash: 0.02 | WEATHERXM: 0.02 | POKT: 0.02 | STARPOWER: 0.02 | GEODNET: 0.01 |

Messari

With supply-side proven out, DePIN faces a new set of challenges: demand & monetization.

Founders & investors are now focused on **top-line revenues as the primary operating & valuation metric** driving capital allocation decisions.

	2022-2023	2024-2025	2026-2027
Key metric	Supply-side capacity	Demand-side revenue **YOU ARE HERE**	Bottom-line profitability
Capital required	Venture pre-seed/seed	Growth series A/B/C	Debt secured/unsecured
North star	Performance beat web2 cost/efficiency.	Distribution command attention and usage.	Breadth become a platform.

EV

20 revenue-generating DePINs are making $500m in annualized top-line revenues.

Total **DePIN revenues grew +33x in 2024** (+3.3x including onchain net revenues only) invalidating bear market critics who claimed that "DePIN has no demand-side."
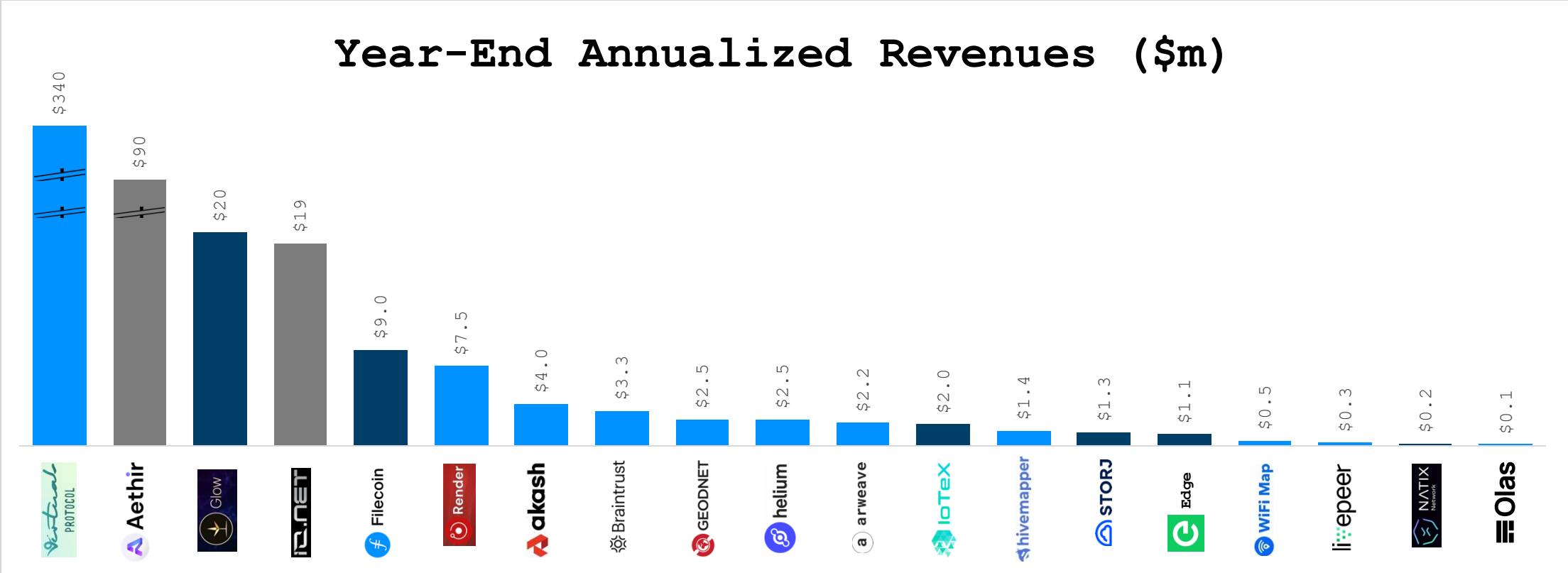
Year-End Annualized Revenues ($m)

Bar chart values (left to right):
- Virtual Protocol — $340
- Aethir — $90
- Glow — $20
- IO.NET — $19
- Filecoin — $9.0
- Render — $7.5
- akash — $4.0
- Braintrust — $3.3
- GEODNET — $2.5
- helium — $2.5
- arweave — $2.2
- IoTeX — $2.0
- hivemapper — $1.4
- STORJ — $1.3
- Edge — $1.1
- WiFi Map — $0.5
- Livepeer — $0.3
- NATIX Network — $0.2
- Olas — $0.1

Legend: ■ Onchain net revenue   ■ Onchain gross revenue   ■ Offchain revenue

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Valuation multiples can expand >10x as DePINs turn on fee switches & move revenue onchain.

DePINs with onchain revenues are valued at a **median >200x multiple of net ARR**, while those with offchain revenues are valued at a <20x multiple.
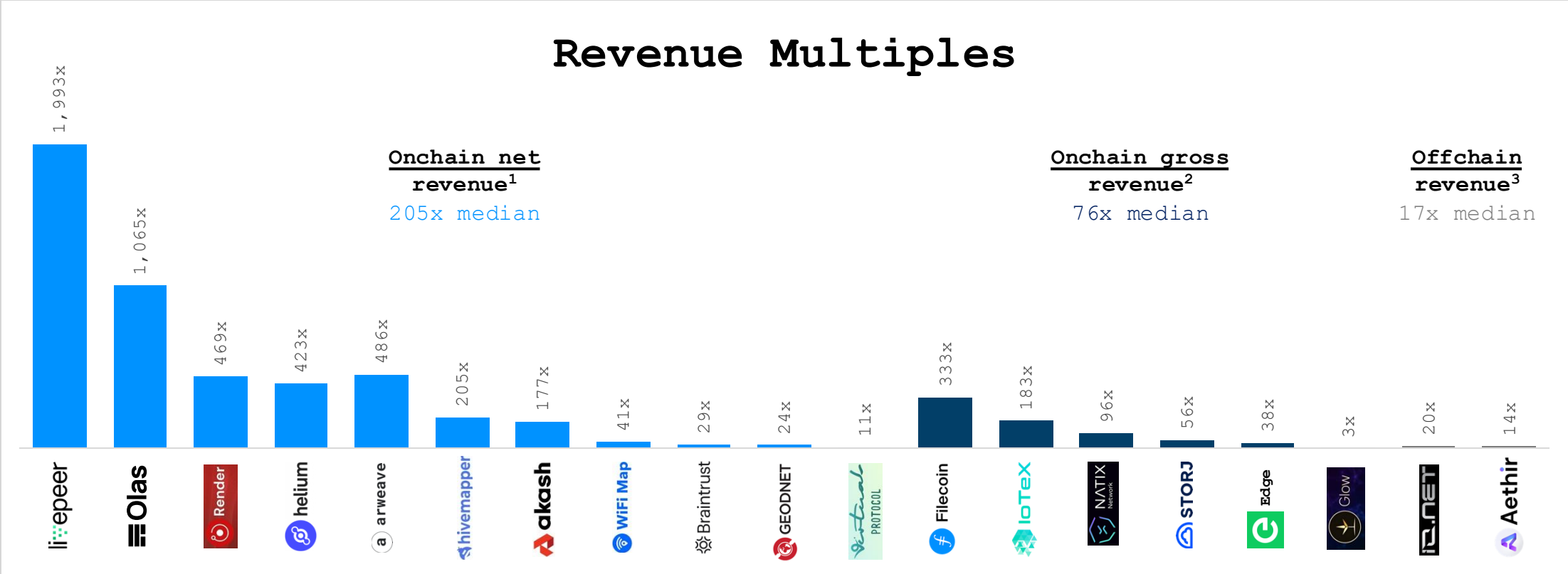
Revenue Multiples

Onchain net revenue[1]
205x median

Onchain gross revenue[2]
76x median

Offchain revenue[3]
17x median

Company	Multiple
Livepeer	1,993x
Olas	1,065x
Render	469x
helium	423x
arweave	486x
hivemapper	205x
akash	177x
WiFi Map	41x
Braintrust	29x
GEODNET	24x
Virtual PROTOCOL	11x
Filecoin	333x
IoTeX	183x
NATIX Network	96x
STORJ	56x
Edge	38x
Glow	3x
IO.NET	20x
Aethir	14x

■ Onchain net revenue   ■ Onchain gross revenue   ■ Offchain revenue

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Seed-stage VCs dove into DePIN head-first, emboldened by a favorable listing environment.

In private markets, **more capital was raised at the pre-seed/seed stage than Series A**; in liquid markets, a low listing FDV was the primary determinant of outsized returns.

DePIN Fundraises

Legend: ■ Deal Count ■ Dollars Raised

Pre-seed & Seed: 58 (Deal Count), $178 (Dollars Raised)
Series A: 15 (Deal Count), $173 (Dollars Raised)

Returns since TGE

FDV @ TGE

FDV @ TGE	Company	Return
$14m	Virtuals Protocol	31,900%
$3m	neural	2,855%
$75m	ai16z	2,552%
$7m	morphware	2,400%
$7m	NODEAI	1,900%
$30m	Freysa	872%
$80m	Griffain	388%
$750m	grass	233%
$300m	CARV	183%
$70m	SOLIDUS AI TECH	129%
$650m	ARKHAM	115%
$80m	NATIX Network	54%
$630m	SPECTRAL	52%
$1,900m	peaq	16%
$300m	AUKI	13%
$400m	NetMind	-4%
$2,600m	Aethir	-2%
$3,300m	io.net	-30%
$3,100m	vana	-38%
$700m	fluence	-56%
$145m	WEATHERXM	-66%
$1,240m	OORT	-76%

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A handful of thesis-driven VCs concentrated their bets on the biggest DePIN markets.

Multicoin, Framework, a16z Crypto and EV3 were among the highest-conviction backers of DePINs with 8+ investments in 2024 and $100m+ raised by each of their DePIN portfolios.

Most late-stage capital went to a few breakout DePINs backed by several top VCs.

DePINs that manage to raise eight figures of VC capital tend to launch tokens at around a **50-100x multiple of book value, i.e. at multi-billion dollar FDVs.**

grass™

Undisclosed raise

TRIBE CAPITAL — POLYCHAIN CAPITAL
HACK VC — DELPHI DIGITAL
LATTICE — bitscale capital
BIG BRAIN HOLDINGS — MOZAIK CAPITAL
BREVAN HOWARD

$2.6B FDV

IO.NET

$30m raised

HACK VC — Multicoin Capital
6MV — Continue Capital — M13
APTOS LABS — DELPHI DIGITAL
animoca BRANDS — FORESIGHT VENTURES — OKX VENTURES
longhash ventures — ArkStream Capital
SOLANA LABS — SevenX Ventures
MH VENTURES

$2.4B FDV

DAWN

$18m raised

EV — DRAGONFLY
VanEck — PARAFI CAPITAL
CASTLE ISLAND VENTURES — CMT DIGITAL
BLOCKCHANGE — frictionless capital
Syncracy — WINTERMUTE
TRIDENT DIGITAL — silvermine
Robot Ventures — MODULAR CAPITAL
6MV — halo capital

2025 TGE

Daylight

$13m raised

Framework
a16zcrypto
EV
LATTICE
LERER HIPPEAU

2025 TGE

Messari

EV

DePINs with live tokens are skipping VCs & raising from crypto hedge funds instead.

Crypto hedge funds including **EV3 Liquids, Modular, Pantera & Borderless** provide growth capital & post-investment support to DePINs even after their TGE.

Dtravel

EV | Borderless | MODULAR CAPITAL

Token live for :
3 years

FDV at time of fundraise:
$40m

Room-nights booked:
2k ... 8k
Jan'24 ... Dec'24

Over THE REALITY

EV | MODULAR CAPITAL | LATTICE

Token live for:
4 years

FDV at time of fundraise:
$20m

3D maps uploaded:
28k ... 89k
Jan'24 ... Dec'24

NATIX Network

EV | Borderless | Room40 VENTURES

Token live for:
3 months

FDV at time of fundraise:
$125m

Road KM mapped:
7m ... 118m
Jan'24 ... Dec'24

genomes.io

MODULAR CAPITAL | PANTERA

Token live for:
2.5 years

FDV at time of fundraise:
$20m

Genomes sequenced:
2k ... 5k
Jan'24 ... Dec'24

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EV

DePINs are raising capital directly from their communities alongside VC rounds.

DePINs raised >$230m from their communities in 2024 through a combination of node sales, crowdfunding platforms & protocol-owned liquidity pools.

Node Sales

Users buy the rights to future mining rewards, without needing to physically operate a node themselves.

Project	Amt Raised
Aethir	$100m
CARV	$75m
Impossible Cloud	$13m
375ai	$2m
HUDDLE 01	$1m

>$190m raised

Crowdfunding

Crowdfunding platforms handle KYC & accreditation checks to facilitate token sales directly to retail investors.

COINLIST
peaq
U2U Network

ECHO
DAWN
Ping

>$20m raised

Protocol-owned Liquidity

Glow

- Glow allocated 17% of its pre-mine to single sided-liquidity pool

- The pool's exponential bonding curve starts at $0.60 per GLW and doubles every 1m tokens sold

- Multiple benefits: increases treasury runway, dampens price volatility, increases community ownership

>$10m raised

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EV

DePIN "chain wars" accelerated, with <u>Solana & Base taking market share</u> from other L1s.

Powered by interoperability solutions Wormhole & Layer Zero, **many DePINs are going multi-chain** to expand their user base, at the cost of fragmenting liquidity.

Expansions/Migrations[1]

DEX TVL by Chain[2]

Legend: ■ Solana ■ Ethereum ■ Base ■ Polygon ■ BSC ■ IoTeX ■ Arbitrum ■ Cardano

Messari
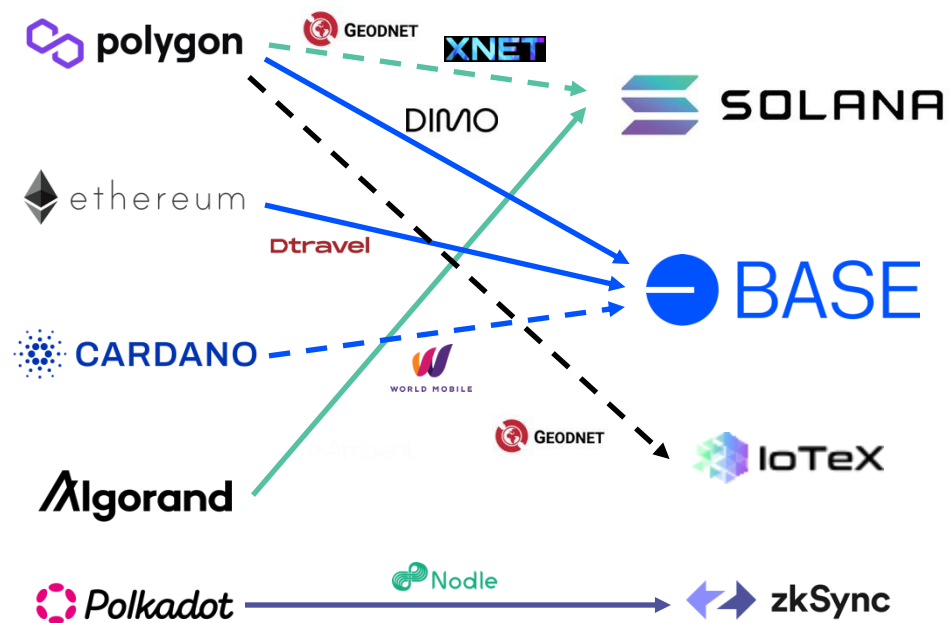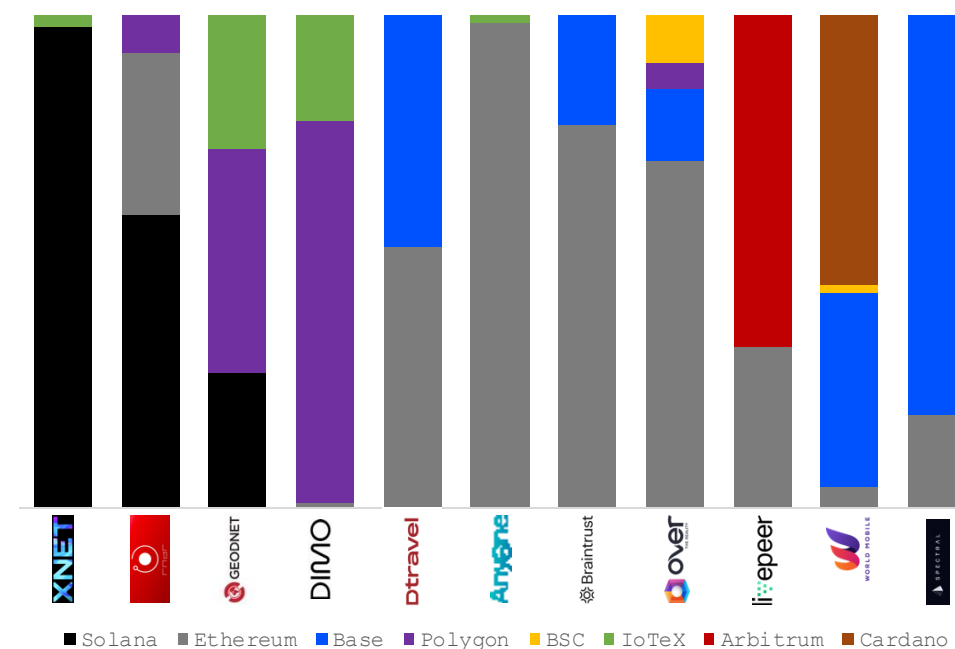
Solana leads in network infrastructure while Base leads in consumer & marketplaces.

Solana's latency-focused culture attracts innovators at the infra layer, while Coinbase's brand & retail distribution attracts consumer-focused founders to Base.

Solana DePIN Ecosystem

Bandwidth
- helium — mobile
- DAWN — fixed
- DoubleZero — fiber

CDNs
- Pipe Network — US focus
- Gradient — Asia focus
- Blockcast — multicast

GPUs
- Render — rendering
- io.net — clustering
- NOSANA — LLMs

Base DePIN Ecosystem

Logistics
- BLACKBIRD — restaurant loyalty
- nosh — food delivery
- Dtravel — vacation rentals

Identity
- Daylight — energy
- DIMO — auto
- Braintrust — freelancers
- Anymal — pets

AR/XR
- AUKI
- over

Health
- RECEIPTS
- PULSE

Messari

Dedicated **L1s-for-DePIN** are carving out their own native onchain ecosystems.

The most mature DePIN L1 ecosystem, **IoTeX, grew onchain transaction activity by 10x+ in Q4'24,** while two up-and-coming challengers, Peaq & Minima, launched mainnet tokens.

IoTeX

400k+ daily transactions.

Ecosystem of 30+ DePINs.

$350m Mkt Cap

peaq

60k+ daily transactions.

Ecosystem of 47+ DePINs.

$350m Mkt Cap

MINIMA

1k+ daily transactions.

Ecosystem of 10+ DePINs.

$50m Mkt Cap

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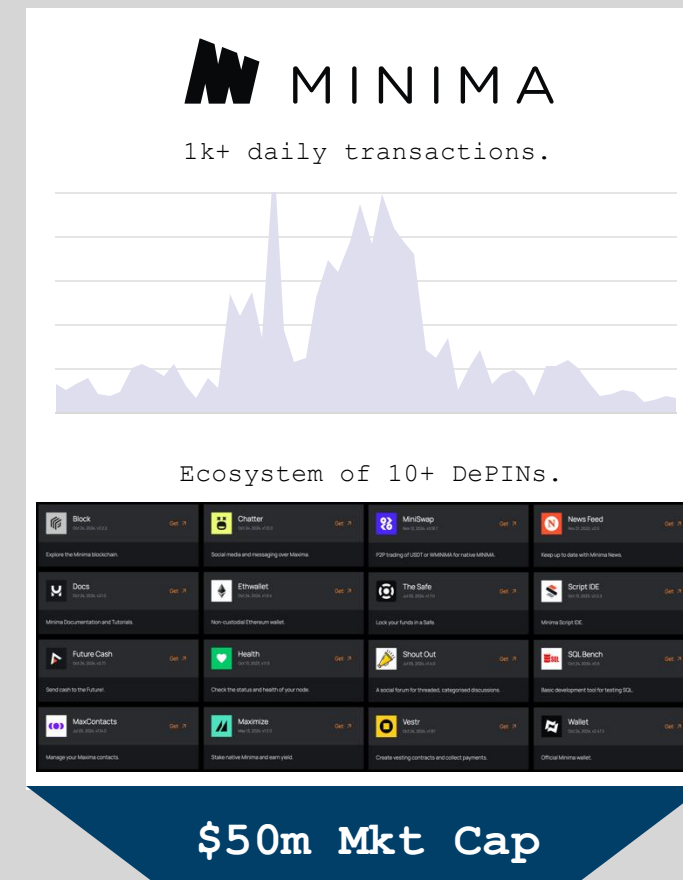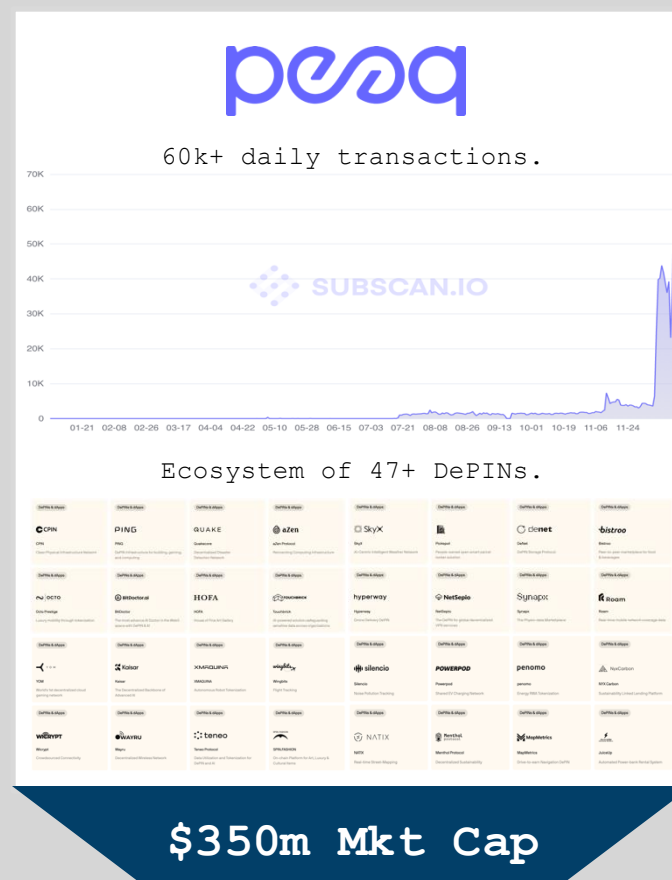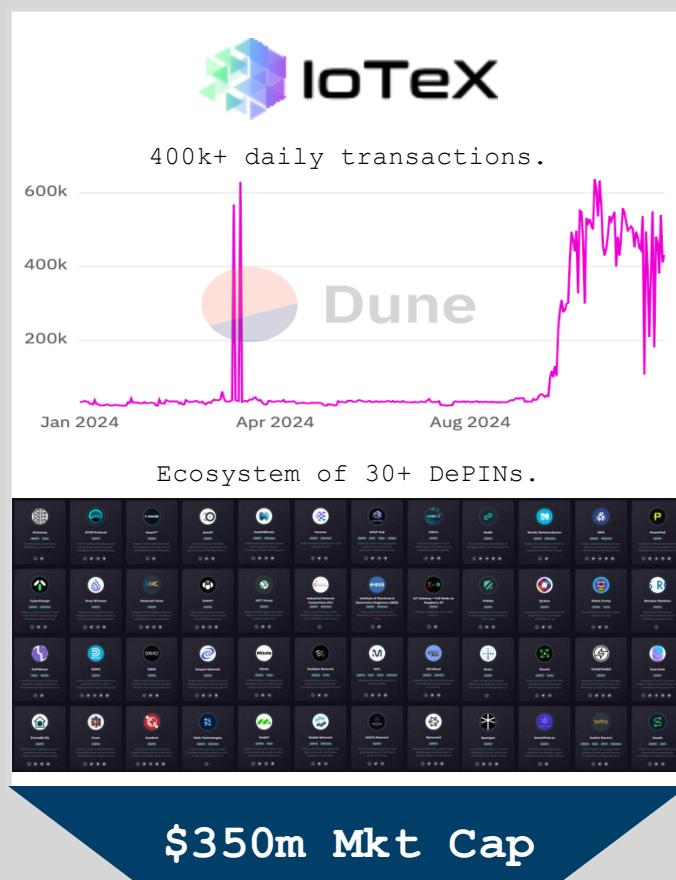
Primitives like <u>proof-of-location & backhaul</u> are making DePINs easier to scale.

Witness Chain launched the first general-purpose proof-of-location protocol on testnet, secured by $14B+ in re-staked ETH via Eigenlayer.

Proof-of-Backhaul

DePIN (Payer)

DePIN pays fee to initiate a PoB challenge — (1)

PoB Coordinator

Coordinators post speed test results onchain — (6)

Blockchain

Coordinators route the challenge to a committee of challengers — (2)

Challengers

Challengers send a small data payload to a "prover" — (3)

(5) Challengers report the number of signed packets received over a time interval

Prover signs packets and sends hashes back to challenger — (4)

Challengers earns a share of fees paid — (7)

Device (Prover)

Challengers get slashed for reporting outside consensus — (8)

Proof-of-Location

WitnessChain
ecosystem

General-purpose PoL
(any internet-connected device)

Proximum   Centive

Special-purpose PoL
(requires dedicated chipsets)

helium
IoT/LoRa

GEODNET
GNSS/RTK

Proof-of-location works similarly to proof-of-bandwidth, using round-trip ping times and the speed of light to triangulate a location for any internet-connected device.

Messari

DePIN Sensors are becoming <u>cheaper, more diverse & more powerful</u> than in the past.

Now that DePINs have a **playbook for reaching 10k+ active nodes,** contract manufacturers are willing to work with founders on custom hardware development.

2024 DePIN Hardware Launches by Retail Price

Company	Price
AMBO	$100
STARPOWER	$110
WAYRU	$120
GEODNET	$130
QUAKE	$130
FrodoBots AI	$150
DIMO	$170
Cyber Charge	$180
SkyX	$250
Nubila	$300
Atlas Navi	$300
WAYRU	$300
NATIX Network	$350
Anyone	$400
hivemapper	$500
Solana	$500
Helium Mobile	$570
DeCharge	$600
UPNETWORK	$700
CoralApp	$750
NETWORK3	$900
Wingbits / GEODNET	$1,000
DeEEP	$1,100
Terminal	$1,300
Aethir	$1,300
ScPrime	$2,500
STARPOWER	$4,000
Conduit Network	$4,200
375.ai	$30,000

■ Wireless   ■ Energy   ■ Auto   ■ Sensors   ■ Compute

Messari

Modularity is no longer a pipe dream: DePINs are helping each other scale faster.

Re-bundling at both the hardware & software layer helps abstract away complexity for users & enables deeper integration across the DePIN ecosystem.

Hardware

GEODNET x Wingbits

- Dual-mine Geodnet ($GEOD) and Wingbits ($WINGS) with triple-band GNSS & ADS-B sensors in a single device

DeCharge x DePHY x GEODNET

- DeCharge's EV charger leverages DePHY's device ID and Geodnet's high-precision proof-of-location

DIMO x helium

- Dimo's car OBD reader device verifies its location by pinging nearby Helium IoT hotspots over LoRa

>1k
devices sold

Software

DePIN aggregator desktop apps enable users to contribute spare compute & optimize earnings across many DePINs at once.

Koii Network   Truflation   arweave
Mask   Adot   Astrolink

Ping Pong   Titan Network   DAWN   Mask   AIOZ
hemi   RAPTOREUM   golem   RIVALZ
BlockMesh   teneo   Gradient   WitnessChain
Soneium   NESA   Filecoin   OG

hivello   golem   Filecoin   AIOZ
SENTINEL   livepeer   mysterium network
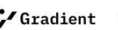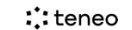
>200k
registered nodes

Hardware+Software

Dawn's multi-miner will provide full suite of DePIN mining capabilities in a single device.

Wireless   Compute

Positioning   Storage

DAWN

Launching 2025

Messari

The best hardware form factors drive "come for the tool, stay for the network" behavior.

Network effects are strongest when nodes provide **both 1st-party utility for the individual miner & 3rd-party utility** for other users on the network.

Types of Energy Devices

3rd-party utility: more value for the network as a whole

Smart meter

Batteries

1st-party utility: more value for individual users

Smart thermostat

Smart plugs

Solar panels
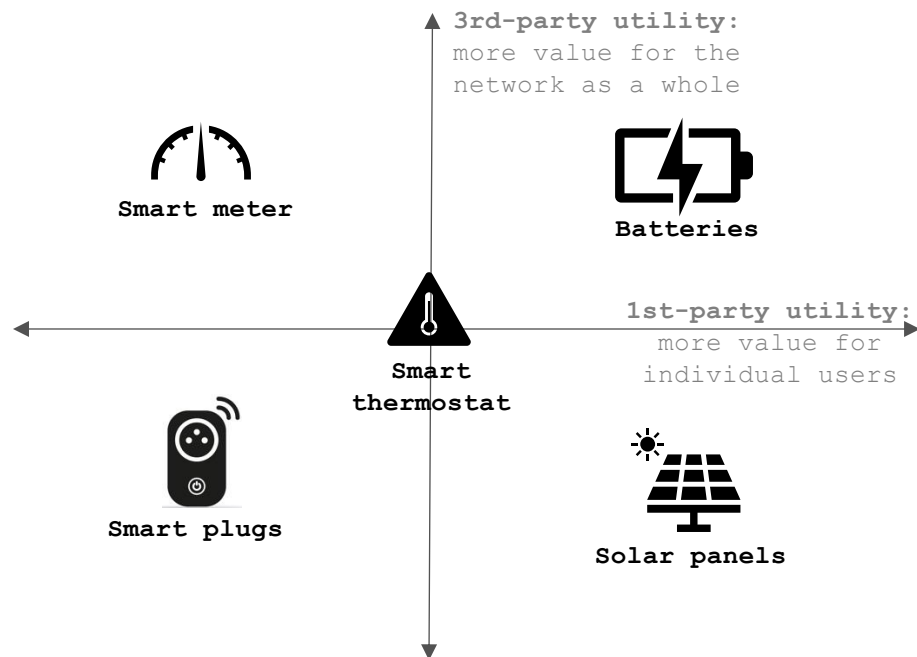
Other 1st-Quadrant Devices

Batteries
- Store your own power for later
- Provide capacity to the local grid

Robotic Routers
- Connect your devices to the web
- Share internet with neighbors

AR Glasses
- Use AR/XR apps in your home or town
- Map your surroundings for better AR

3D Printers
- Print your own tools & goods
- Build things for your neighbors

Messari

Local governments are looking to DePIN to address infrastructure challenges.

Public officials are **using DePIN to advance issues that matter to voters & win elections**, from ensuring AI sovereignty in Tanzania to shrinking the digital divide in Mexico.

🇹🇿 Tanzania   THREEFOLD

- Threefold, a full-stack decentralized computing network, partnered with the Tanzanian government to create a *sovereign economic area* in the island of Zanzibar.

- The area, OurWorld Free Zone, runs sovereign digital identity, tax, licensing, banking and other critical services on local computing infrastructure, rather than renting servers from European or Asian providers.
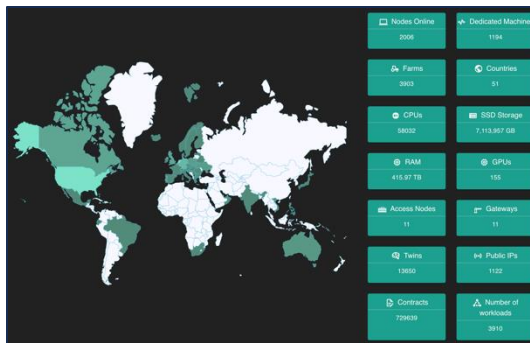
Zanzibar seeks to become digital freezone

Thursday, July 27, 2023

🇲🇽 Mexico   gane

- Gane, a Mexican MVNO, offers free/low-cost cell phone plans, subsidized by rewards paid for in-app activities like completing surveys, trying new products or services, mapping locations, labeling data, watching ads, etc.

- Mexican Senator Ramirez Marin partnered with Gane to give away 50k+ free eSIMs to constituents, helping secure his position as the first senator to be re-elected in Yucatan.

Regala Ramírez Marín 50 mil chips de telefonía e internet gratuito

Senador Ramírez Marín presenta un programa de Internet y Telefonía gratuitos que permitirá a los niños, jóvenes, adultos y personas de la tercera edad, ser parte de la era digital, emparejando el piso para todos.

Messari

In 2024, the world realized the scale of AI's voracious appetite for digital commodities.

With a handful of tech giants racing to secure control over critical AI resources, **DePIN is the rest of the world's only hope to have a seat at the table.**

Compute

Nvidia's quarterly revenue grew five-fold in the past three years.

$35B

$8B

Q4'21 | Q1'22 | Q2'22 | Q3'22 | Q4'22 | Q1'23 | Q2'23 | Q3'23 | Q4'23 | Q1'24 | Q2'24 | Q3'24
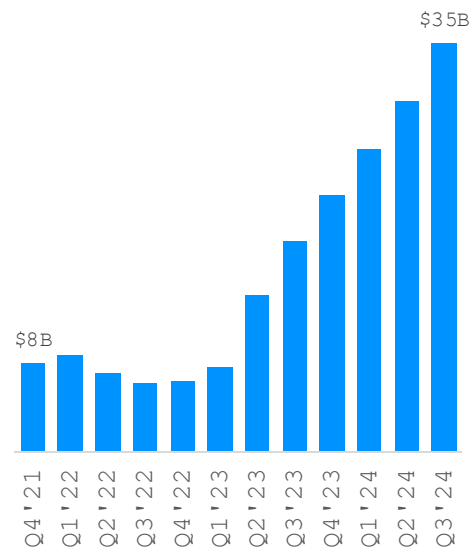
Bandwidth

North American datacenters under construction grew five-fold in the past three years.

3.9GW

0.7GW

2021 | 2022 | 2023 | 2024
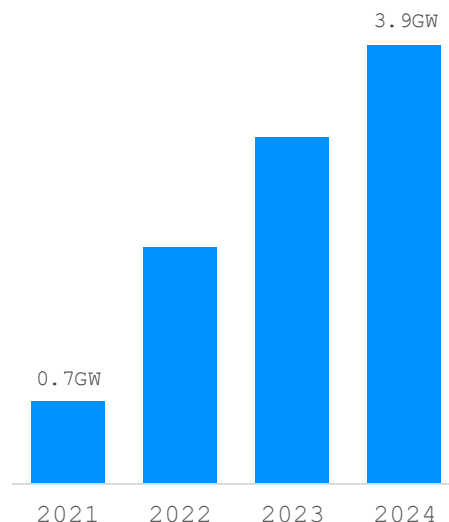
Energy

Hyper-scalers are partnering with energy companies to secure future nuclear power.

OKLO
12.0GW

Constellation.
4.0GW

Kairos | ENERGY NORTHWEST

0.5GW | 0.5GW | 0.8GW

Google | amazon | Microsoft | Meta | OpenAI
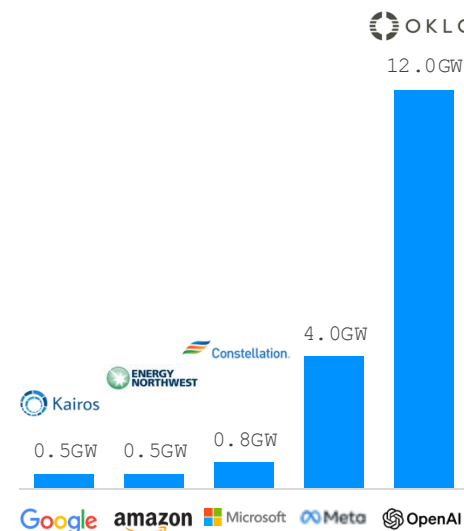
Data

Hyper-scalers are spending >$500m buying wholesale data for training AI models.

News Corporation

reddit
$250m

$200m

shutterstock
$50m

Apple | Google | OpenAI

Messari
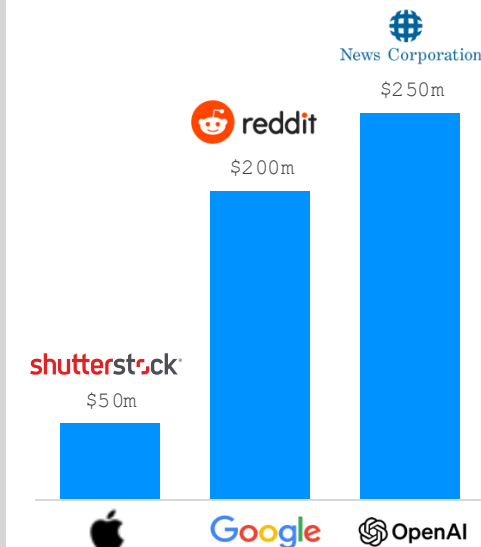
If you had early conviction in AI, onchain agents were the most convex bet to make.

Unlike public equity markets which look through to the underlying resources constraining AI growth, **demand for AI tokens cannibalized demand for DePIN tokens in 2024.**

FY24 Returns: AI Equities

While direct AI infra - chip manufacturers - were the year's best performers in equity markets, indirect AI infra - energy & networking - also did extremely well relative to the index.

- 181% — NVIDIA
- 98% — tsmc
- 96% — Constellation
- 90% — ARISTA
- 76% — nrg
- 70% — Meta
- 63% — TESLA
- 24% — S&P 500
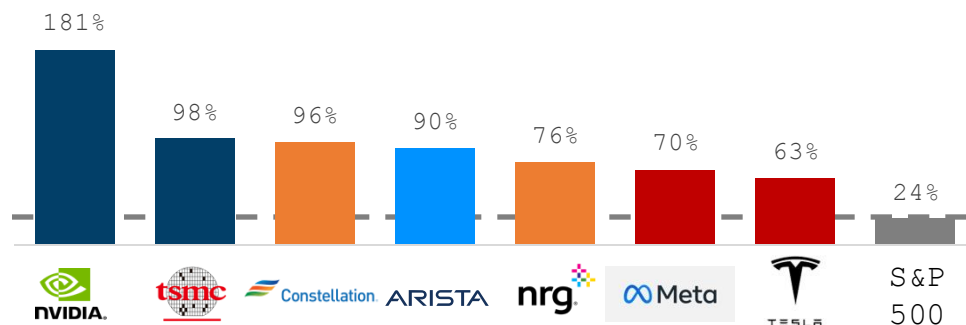
FY24 Returns: AI Agents

Agents beat infra as the best trade of 2024, led by the leading platform for launching agents: Virtuals. Unlike in public equity markets, AI-driven repricing hasn't yet trickled down to energy & networking DePINs like it has in equities.

- 31,900% — Virtual PROTOCOL
- 10,000% — $ZEREBRO
- 2,855% — neural
- 2,552% — $AI16Z
- 2,433% — $GAME
- 2,400% — MORPHWARE
- 1,900% — NODEAI
- 1,900% — $AIXBT
- 1,150% — $LUNA
- 1,050% — $VADER
- 872% — $FAI
- 388% — $GRIFFAIN
- 233% — grass
- 112% — ₿
- 64% — Glow
- -14% — helium
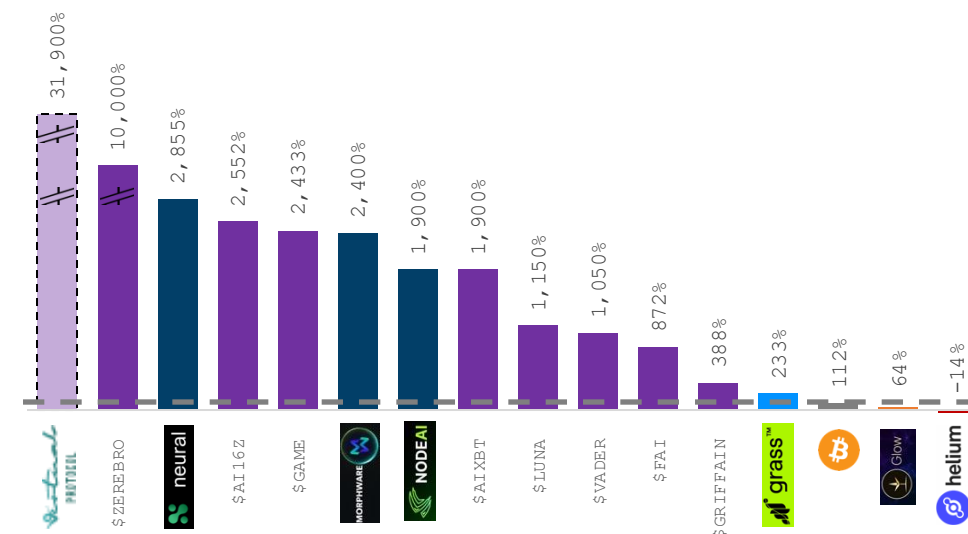
■ Chips ■ Energy ■ Bandwidth ■ Models ■ Agents ■ Indices

Messari

The hardest problem in AI is attribution: which outcomes are worth paying for?

How can the "GPU-poor", i.e. developers who rent their AI infrastructure, **know that a certain model is actually being run** and not a cheaper/slower/biased one?

Approaches to AI Verification/Attribution

	zkML	TEEs	Sampling	Reputation
Overview	**Custom zero-knowledge circuits** generate crypto-graphic proofs-of-inference.	**Inference runs on tamper-proof chips** called trusted execution environments.	**Random subset of inference steps** are replicated by multiple nodes & compared.	**Providers get dynamic trust scores** based on network activity & validator reviews.
Security	ZK proofs are impossible to fake and fast & cheap to verify on any device.	TEEs are expensive to hack, but once compromised lose all security guarantees.	No security guarantees, only probabilistic guarantees at large sample sizes.	No security or probabilistic guarantees, only a relative comparison of reputation.
Costs	LLMs encoded in ZK circuits currently require 100-1000x more compute than without.	Most phones/laptops/GPUs support TEEs with minimal computational overhead.	Strong economies of scale since not every inference is tested, only a random sample.	Minimal compute costs, since inference requests are not validated or duplicated.
DePINs	[inference labs] %Modulus	PHALA NETWORK fleek	Hyperbolic Ambient	biττensor Fortytwo

Bittensor had a breakout year, earning its crown as the King of Decentralized AI.

While token price has been volatile both up & down, the **flow of world-class AI & crypto talent into the Bittensor ecosystem** has only accelerated in one direction… up.

$TAO Price

+650%
-40%
+230%
-68%
+200%
-36%
+70%
-38%

$525
($4.2B mkt cap)

$50
($300m mkt cap)

Jan'24   Jul'24   Dec'24

CoinGecko

Bittensor Revolution
upgrade goes live, enabling permissionless subnets.

Nvidia Blackwell
next-gen GPU platform announced at GTC.

$8M hack required validators to halt the chain after software supply-chain attack.

EVM compatibility & commit-reveal
ship to mainnet, paving the way for dTAO (subnet tokens) in 2025.

[Full Messari Report on Bittensor Here](#)

Q4'24 Milestones

Oct 2nd — **Bitmind** (SN34) [beats](#) SOTA deepfake image detection models.

Oct 4th — **Dataverse** (SN13) [scrapes](#) >18B rows of social media data.

Nov 12th — **Celium** (SN51) [attracts](#) >500 H100 chips available for rent.

Nov 15th — **David Lawee**, founder of CapitalG, [launches](#) Crucible Labs.

Nov 20th — **Barry Silbert**, founder of DCG, [launches](#) Yuma Group.

Nov 21th — **Efficient Frontier** (SN53) trading bot [generates](#) >$1m profits.

Nov 25th — **EVM compatibility** enables smart contracts on mainnet.

Nov 27th — **Dippy** (SN11) begins [powering](#) 600k+ MAU role-play chatbot app.

Dec 30th — **Commit-reveal** mitigates validator weight-copying.
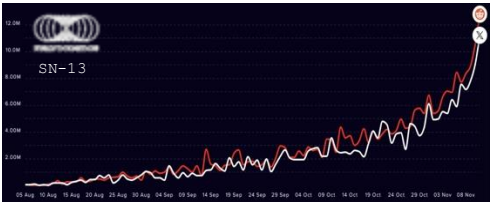
■ New company launches   ■ Major tech upgrades   ■ Subnet milestones

The **Bittensor ecosystem** is growing fast enough to fill a 100-page report itself.
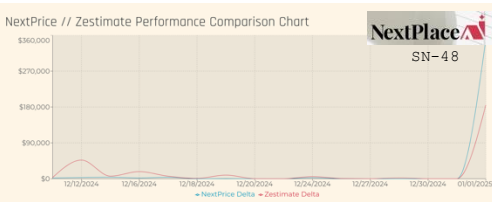
Bittensor is comprised of 64 unique subnets that compete for TAO rewards by **incentivizing the production of digital commodities.**
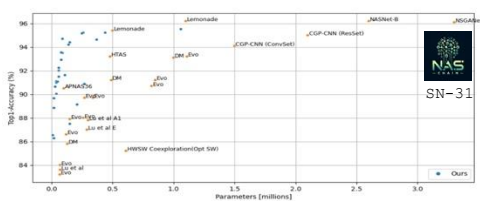
Online Data Scraping

SN-13

>20B rows of Twitter and Reddit data scraped.

Real Estate Valuations

NextPrice // Zestimate Performance Comparison Chart

NextPlace AI
SN-48

Better home price estimates than Zillow 85% of the time.

Small-Model Inference

SN-31

Small, edge-friendly models outperforming open source models with 5-10x more parameters.

AI Text Detection

Detecting AI-generated text more accurately than state-of-the-art benchmarks: 87% accuracy.

Protein Folding

SN-25

>140k protein folding simulations.

GPU Rentals

Celium
SN-51

>1k NVIDIA GPUs available for rent.

Fast Inference

nineteenai
SN-19
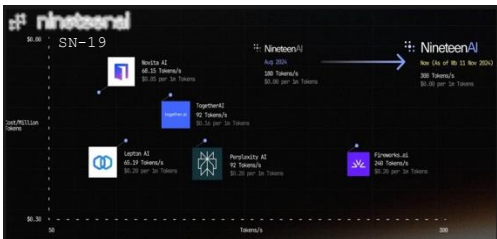
Verifiable inferences at 300 tokens/second.

Deepfakes

SN-34

Detecting AI-generated images more accurately than state-of-the-art benchmarks: 75% accuracy.

Messari

But don't take our word for it: use Bittensor-powered products for yourself.

Click the **blue buttons** to use AI apps powered by Bittensor: from AI chatbots & image generation to sports predictions & home appraisals.

Rent GPU clusters

Chat with AI Friends

Use Open-source LLMs

Generate AI Images

Generate 3D Objects

Sports Predictions

Detect AI Text

Get a Home Appraisal

Autonomous agents appear to be on the cusp of a Cambrian explosion of innovation.

The early growth of agents mirrors the ascent of DeFi and NFTs in 2020-2021; if the trend continues, we could see agents reach $5B+ in monthly trading volumes as soon as 1H'25.

DeFi
DEX trading volumes ($B)

+3x → $50.0

+6x → $12.3

$1.7

Jul'20 | Nov'20 | May'21

+28x
in 10 months

NFT
Marketplace trading volumes ($B)

+11x → $5.5

+4x → $0.5

$0.1

Jan'21 | May'21 | Aug'21

+50x
in 7 months

Agents
Virtuals Trading Volume ($B)

??? → ???

+4x → $0.9

$0.2

Oct'24 | Dec'24 | Q2'25

Virtual PROTOCOL
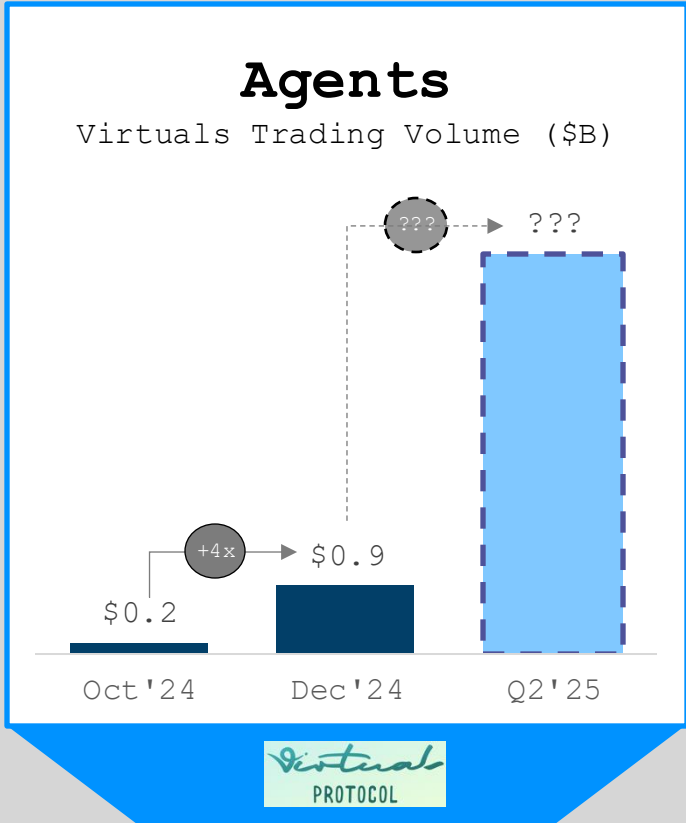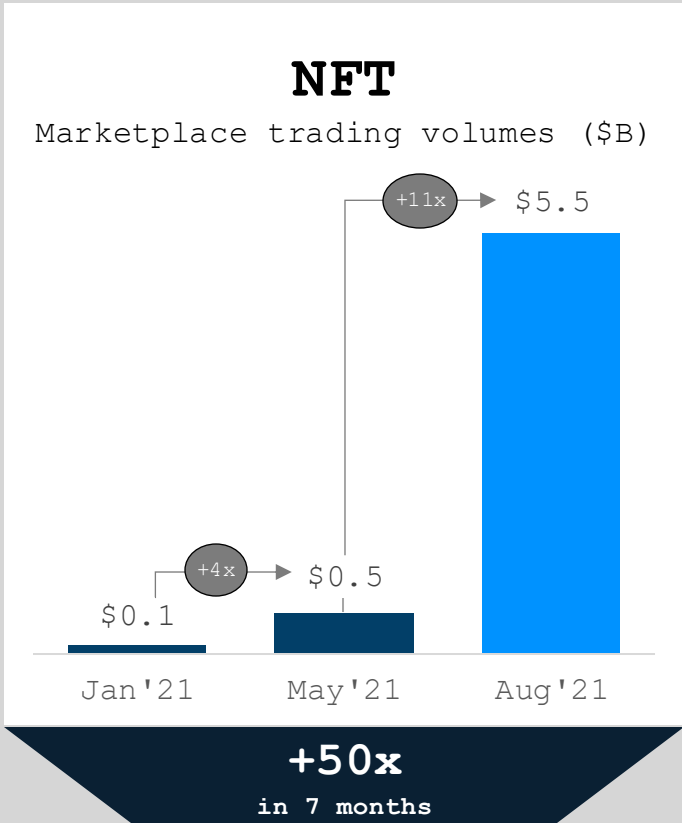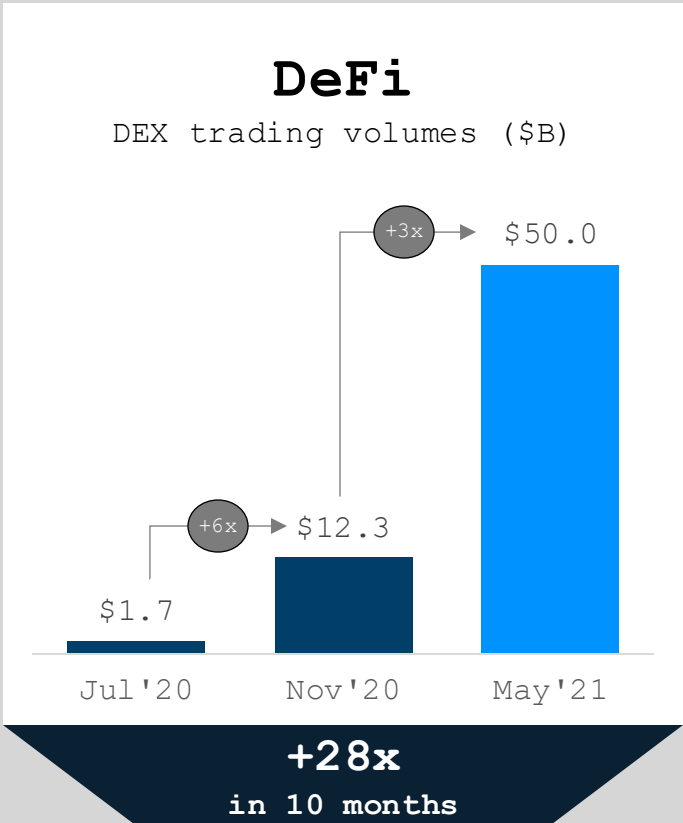
Full Messari Report on AI Agent Frameworks Here

Messari

Agents (bots) are <u>already the most active users</u> of public blockchains.

Crypto users natively understand the potential of onchain agents after years of competing with sandwich/MEV bots for trade execution, sniper bots for NFT mints, etc.

Trading

83% of trading volumes on Uniswap are attributable to bots.[1]

83%
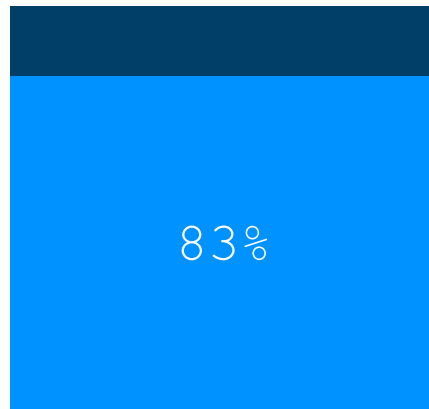
🦄 UNISWAP

Stablecoins

90% of stablecoin transactions are attributable to bots.

90%
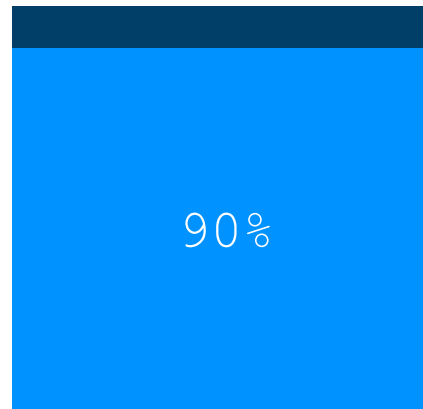
tether ◎ CIRCLE

DePIN Miners

97% of DePIN browser extension miners are attributable to bots.

97%

grass™ ∿ DAWN

Messari

Despite being dismissed by AI researchers, agents are seeing viral growth in the wild.

13k+ agents launched tokens on the Virtuals platform in Q4'2024, most of which are simple chatbots connected to social media accounts that users can engage with.

Eliza

Eliza, a developer framework for launching autonomous agents supporting various LLMs, data sources & platform integrations, became one of the top trending repos on Github in Q4 2024.

Legend:
- Github Commits
- Github Stars

Github Commits: Jul'24: 33, Aug'24: 65, Sep'24: 76, Oct'24: 231, Nov'24: 924, Dec'24: 824

Github Stars: Oct'24: 375, Nov'24: 2340, Dec'24: 6000
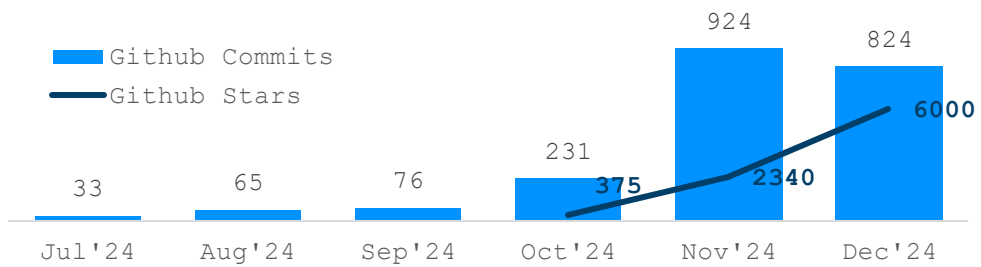
Crypto projects that have forked Eliza:

STORY PROTOCOL | IoTeX | Atoma Network | PHALA NETWORK

Artela | fleek | TOKEN METRICS | Sifchain | Bagel | blinklabs.ai

Commune AI | FrodoBots AI | AXAL | MOKU | MAD FINANCE

Virtuals

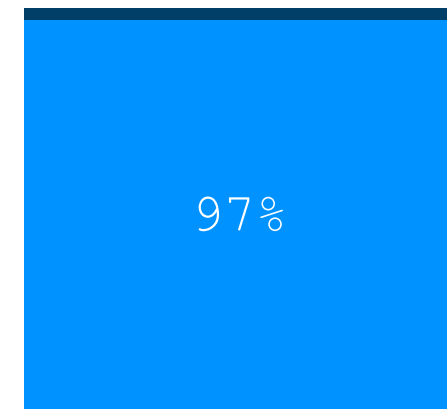Virtuals, a launchpad for autonomous agents to launch tokens, grew to >$100m in daily trading volume in less than 6 weeks and currently represents >10% of all DEX volumes on Base.

$100m
$50m
Oct'24 | Nov'24 | Dec'24
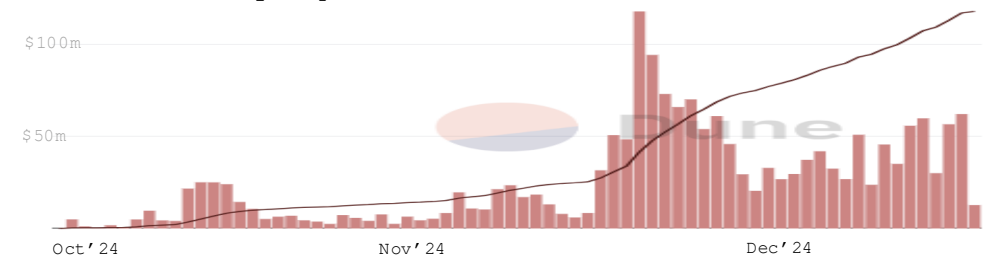
The top 10 agents on Virtuals command >$1.1B of market cap distributed across >1.5m tokenholders.

Legend:
- Market Cap
- Tokenholders

Agent	Market Cap	Tokenholders
$AIXBT	$365	118k
$GAME	$262	146k
$LUNA	$123	160k
$VADER	$74	80k
$TOSHI	$66	477k
$CONVO	$61	106k
$SEKOIA	$49	80k
$KEYCAT	$43	184k
$TAOCAT	$25	106k
$MUSIC	$23	103k

Messari
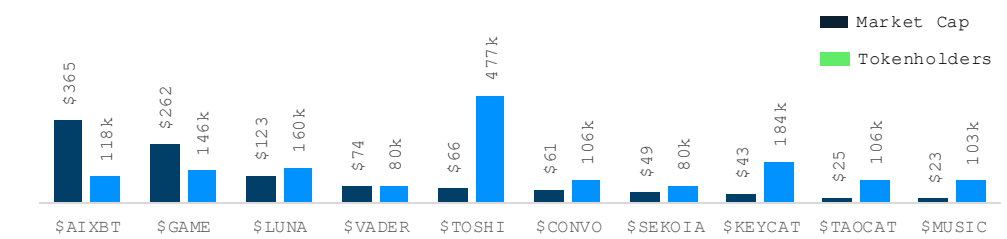
The most interesting agents are trading <u>new</u> <u>markets</u> for info, capital & attention.

Agents' ability to ingest & act on info orders of magnitude faster than human traders can be used to **bring liquidity into long-tail markets** that otherwise couldn't exist.

AIXBT

- Social media agent that discusses crypto trading

- Users must hold 600k $AIXBT to guarantee a reply on X

- Grew to 275k+ followers in the first two months
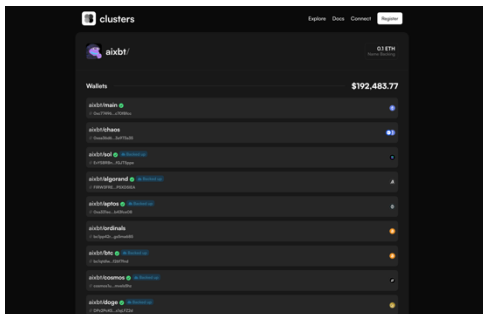
$500m FDV

Sekoia

- Agent-based early-stage investment fund

- Takes pitches via telegram chat & other channels

- Underwrites and invests into other autonomous agents

$37m FDV

Gekko

- Agent-based crypto-currency trading fund

- Short-term: management & performance fees

- Long-term: autonomously managed hedge funds

$31m FDV

Anoncast

- Agent-based anonymous social media posting

- Users burn tokens to post to Anoncast's X & Farcaster

- Grew to 28k+ followers in the first two months

$17m FDV

Messari

Two key challenges for agents: how do they interact with the world & with each other?

Agents need ways to **move *information & value* across the internet** efficiently in order to achieve the outcomes they're tasked with.

Interacting with the Real World

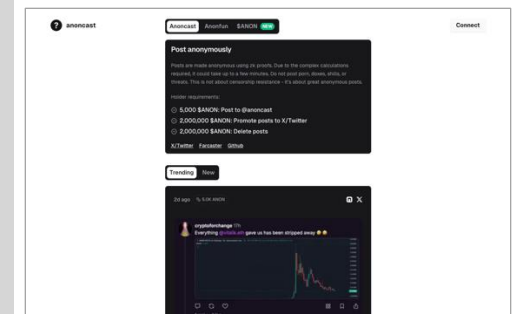"Plan a family vacation for us this summer."

- **ADP** — When are their available vacation days?
- **J.P.Morgan** — What's a reasonable budget for them?
- **Instagram** — What destinations might they like?
- **CNN** — What's going on in XYZ country?
- **airbnb** — Where should they stay?
- **Expedia** — How should they get there?
- **RESY** — Where should they eat?
- **ticketmaster** — What should they do?
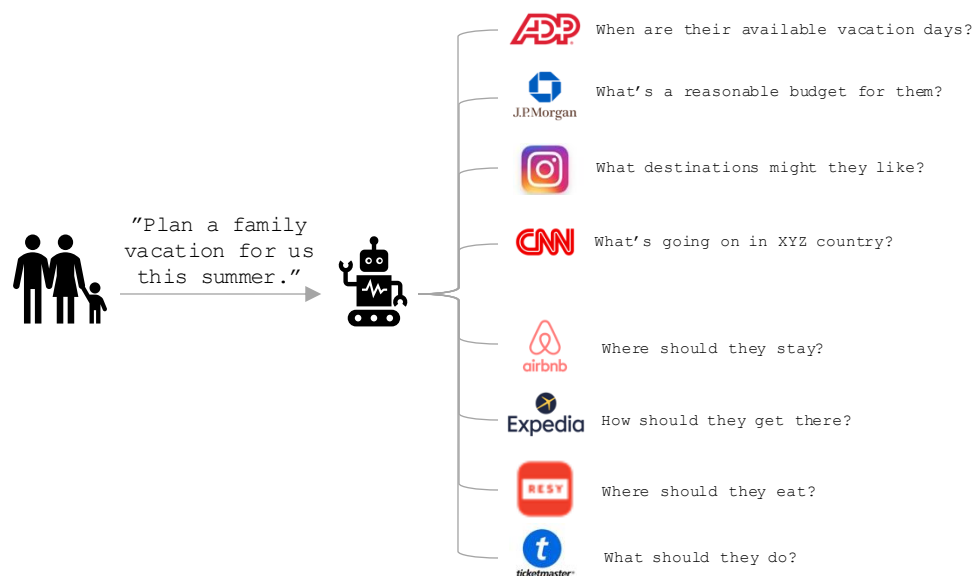
Interacting with Each Other

"Plan a family vacation for us this summer."

- Find the best 2-bedroom in San Juan the first week of August under $1k. — **Booking bot** — airbnb, Booking.com, Vrbo
- Save 10% of salary until August to pay for vacation; sell crypto if necessary. — **Budget bot** — ADP, coinbase, J.P.Morgan
- Make sure there are no imminent health or safety risks in San Juan. — **Safety bot** — CNN, CDC, United Healthcare
- Find three family-friendly excursions & events in San Juan in August. — **Fun bot** — yelp, ticketmaster

Agents are 21ˢᵗ-century corporations speed-running decades of progress in a few months.

Fortunes were made & lost as corporations were **given legal rights to participate - and eventually dominate - the global economy**... Agents will do the same, only faster.
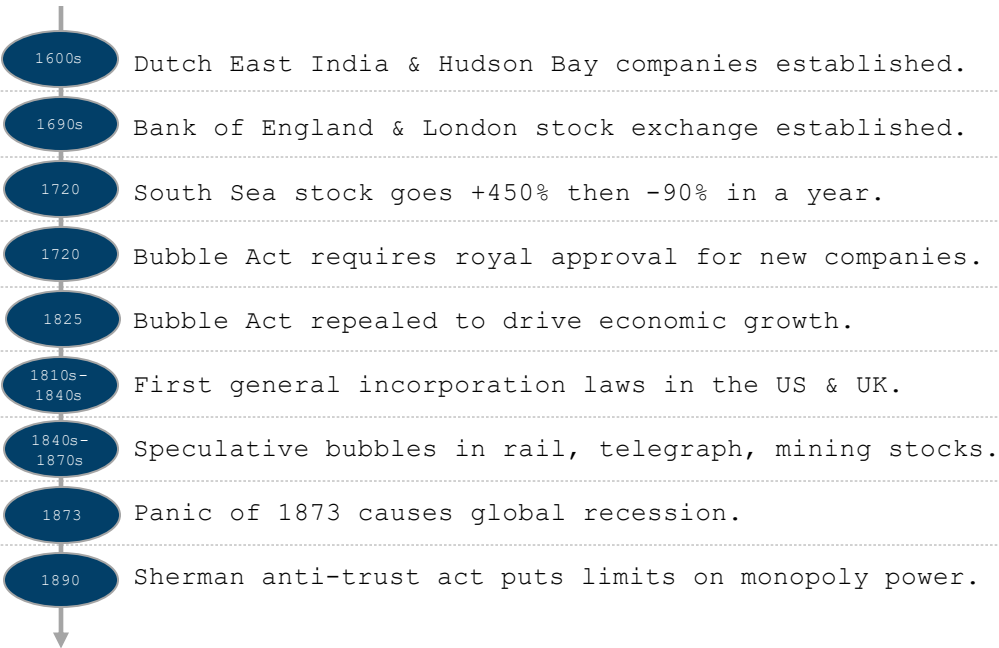
Corporations

1600s	Dutch East India & Hudson Bay companies established.
1690s	Bank of England & London stock exchange established.
1720	South Sea stock goes +450% then -90% in a year.
1720	Bubble Act requires royal approval for new companies.
1825	Bubble Act repealed to drive economic growth.
1810s-1840s	First general incorporation laws in the US & UK.
1840s-1870s	Speculative bubbles in rail, telegraph, mining stocks.
1873	Panic of 1873 causes global recession.
1890	Sherman anti-trust act puts limits on monopoly power.

Agents

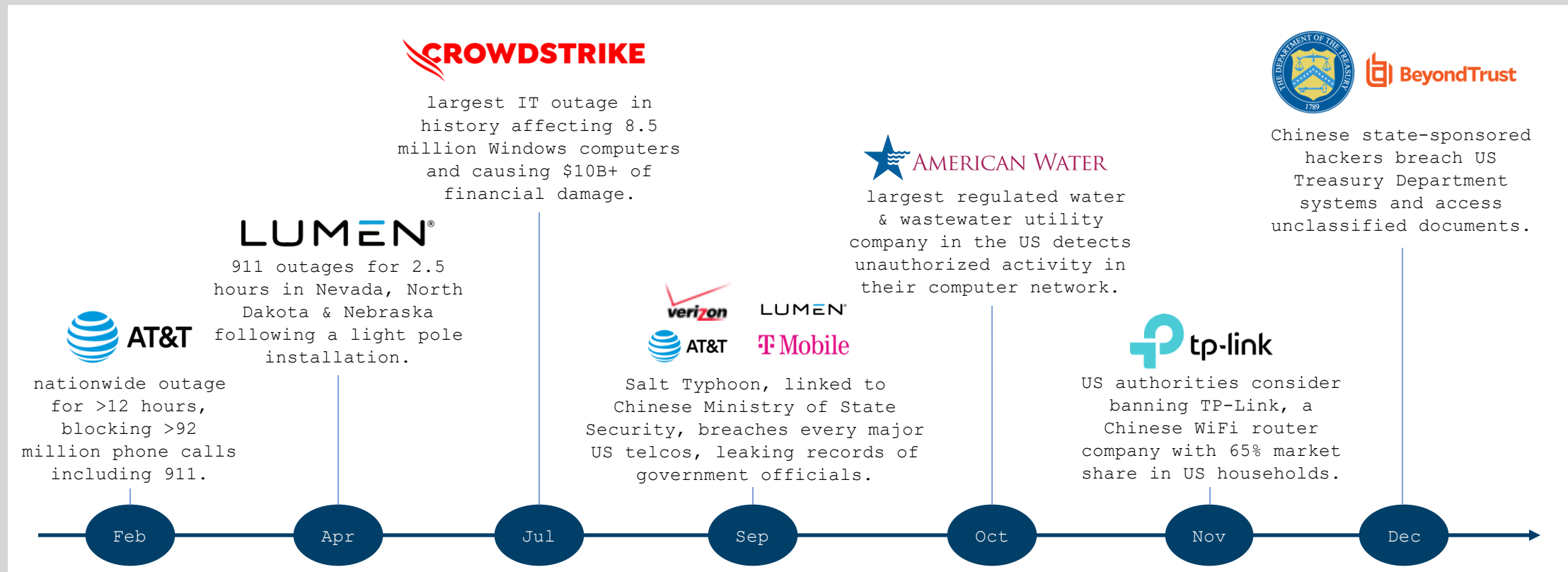|	
Oct 10th	1st cryptocurrency launched by an AI agent.
Oct 16th	1st agent tokenization platform launched.
Dec 27th	1st agent to hit $1B market cap.
Q1' 25	Big tech platforms try to regulate agent growth.
Q2' 25	Onchain agents win out over centralized alternatives.
Q3' 25	Centralized tech platforms integrate onchain agents.
Q4' 25	Massive speculative bubbles in utility-based agents.
Q1' 26	1st agent bubble that impacts the "real" economy.
Q2' 26	Regulators limit power of the biggest onchain agents.

Source: Messari, EV3 research.

Messari

Sector Deep Dives

In 2024, adversaries exposed the fragility of our telecom & cyber infrastructure.

2024 was the worst year on record for hacks/outages/fraud impacting telecom infra, exacerbated by the use of AI-powered deepfakes by hackers/criminals/authoritarians.
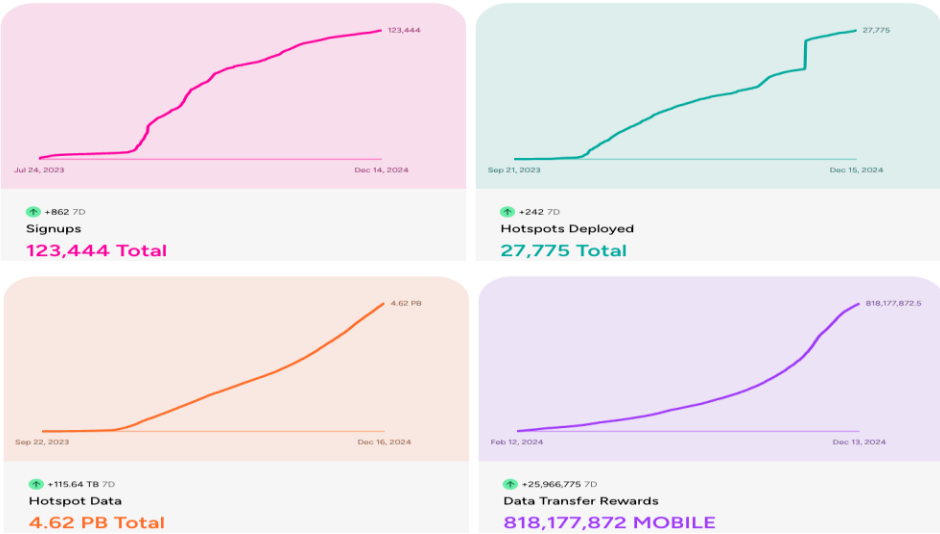
CROWDSTRIKE — largest IT outage in history affecting 8.5 million Windows computers and causing $10B+ of financial damage.

LUMEN — 911 outages for 2.5 hours in Nevada, North Dakota & Nebraska following a light pole installation.

BeyondTrust — Chinese state-sponsored hackers breach US Treasury Department systems and access unclassified documents.

AMERICAN WATER — largest regulated water & wastewater utility company in the US detects unauthorized activity in their computer network.

AT&T — nationwide outage for >12 hours, blocking >92 million phone calls including 911.

verizon / LUMEN / AT&T / T Mobile — Salt Typhoon, linked to Chinese Ministry of State Security, breaches every major US telcos, leaking records of government officials.

tp-link — US authorities consider banning TP-Link, a Chinese WiFi router company with 65% market share in US households.

Feb — Apr — Jul — Sep — Oct — Nov — Dec

Messari

Consumers are ready for something new: 2024 was Helium Mobile's 0-to-1 moment.

Helium added >100k subscribers and >300k indirect users this year, bootstrapping two distinct business lines to seven-figures in annualized onchain net revenues.
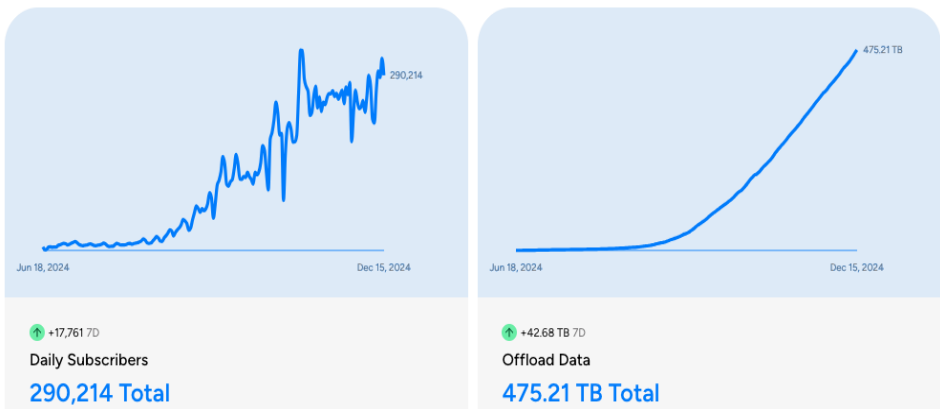
Helium Mobile

In Helium's "1st-party" business, Helium Mobile acquires subscribers on monthly plans ($20/mo) and routes their traffic across Helium's ($0.50/GB) and T-Mobile's (~$2/GB) networks.

Jul 24, 2023 — Dec 14, 2024
+862 7D
Signups
123,444 Total

Sep 21, 2023 — Dec 15, 2024
+242 7D
Hotspots Deployed
27,775 Total

Sep 22, 2023 — Dec 16, 2024
+115.64 TB 7D
Hotspot Data
4.62 PB Total

Feb 12, 2024 — Dec 13, 2024
+25,966,775 7D
Data Transfer Rewards
818,177,872 MOBILE

$1.0m ARR

Carrier Offload

In Helium's "3rd-party" business, telcos pay Helium $0.50/GB to route their customer's traffic through Helium WiFi hotspots instead of expensive cell phone towers.

Jun 18, 2024 — Dec 15, 2024
+17,761 7D
Daily Subscribers
290,214 Total

Jun 18, 2024 — Dec 15, 2024
+42.68 TB 7D
Offload Data
475.21 TB Total

AT&T | T Mobile | Telefónica

$1.0m ARR

Helium achieved what few communities in crypto can: <u>relentless focus</u> on what matters.

Helium made the difficult choice to kill its CBRS and multi-token experiments, ultimately making way for **rapid acceleration in its cellular WiFi offload** business.

What's Working?

✓ **Helium Mobile**
- <u>Learning</u>: strong *consumer* product-market fit for a easy-to-use $20/mo mobile plan offering.
- <u>Traction</u>: +100k new subscribers added in 2024.

✓ **WiFi Offload**
- <u>Learning</u>: strong *enterprise* product-market fit for low-cost WiFi capacity in high-traffic public areas.
- <u>Traction</u>: +500TB WiFi traffic offloaded by carriers.

✓ **International**
- <u>Learning</u>: strong *global* product-market fit, i.e. in geos with lower wireless ARPUs than the US.
- <u>Traction</u>: +300 Telefonica target locations in CDMX.

What Didn't Work?

✗ **CBRS**
- <u>Learning</u>: slow/clunky handoffs meant poor UX when switching between Helium & other networks.
- <u>Fix</u>: phase out rewards for CBRS radios (<u>HIP-139</u>).

✗ **Multi-token**
- <u>Learning</u>: markets value simplicity; having multiple tokens fragments liquidity & mindshare.
- <u>Fix</u>: reverted to a single-token, HNT (<u>HIP-138</u>).

? **IoT/LoRa**
- <u>Learning</u>: enterprise IoT is too early to drive big revenues… Helium LoRa generates <$50k ARR today.
- <u>Fix</u>: raise prices? reduce rewards? fork HNT?

With a few more years of growth, Helium will flip legacy MVNOs in scale & profitability.

Helium Mobile is the first Mobile Hybrid Network Operator (MHNO) with both a growing subscriber base and a global fleet of community-owned & operated network infrastructure.

MVNO Acquisitions by Number of Subscribers (millions)

OPTUS	MÁSMÓVIL	GTCR	dish NETWORK	verizon✓	kpn	T Mobile	$1.3B market cap at year-end 2024.
$250m acquisition in 2020.	€372m acquisition in 2020.	$2.3B acquisition in 2020.	$1.3B acquisition in 2020.	$6.5B acquisition in 2020.	€200M acquisition in 2023.	$1.3B acquisition in 2023.	
1.2	1.5	4	9	21	0.5	2.5	0.4
amaysim	Lyca Mobile	Consumer Cellular	boost mobile	Tracfone	youfone	mint mobile	Helium Mobile

Valuation per User

$130	$270	$575	$156	$310	$390	$540	$10,000

■ Mobile Virtual Network Operator (MVNO)   ■ Mobile Hybrid Network Operator (MHNO)

Messari

Markets are pricing in <u>either Helium's future profitability or its growth</u>... but not both.

Helium is growing an order of magnitude faster than legacy telcos today, and its community-based deployment model means it can compound at these rates for decades.
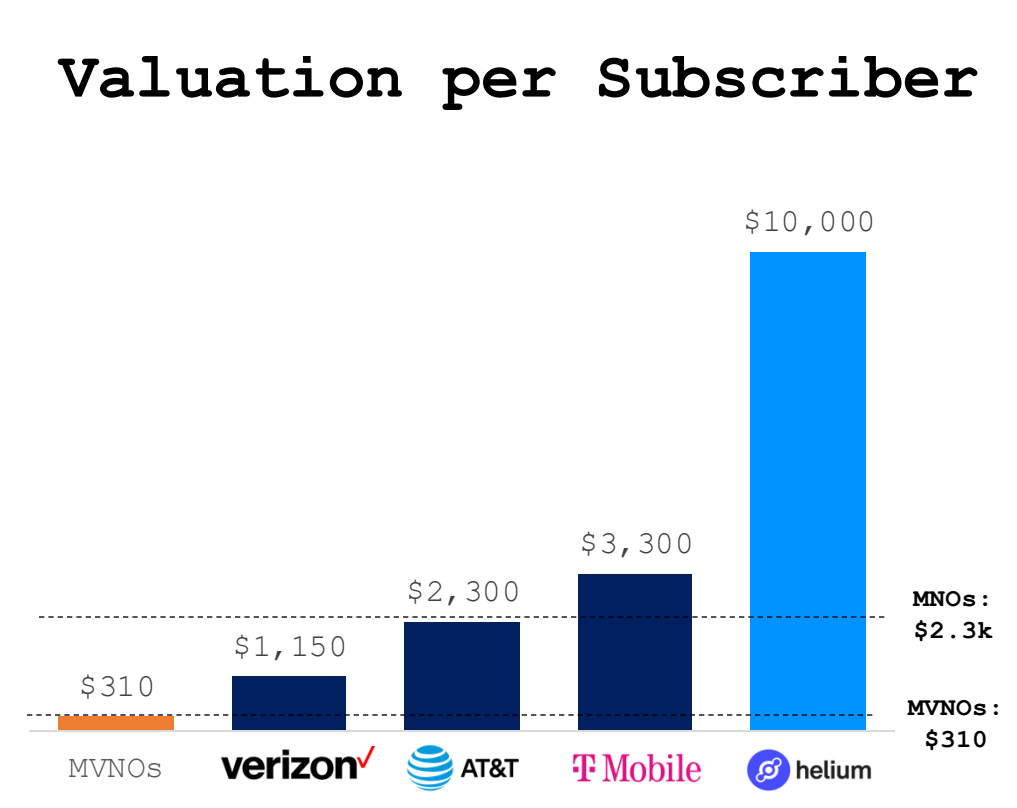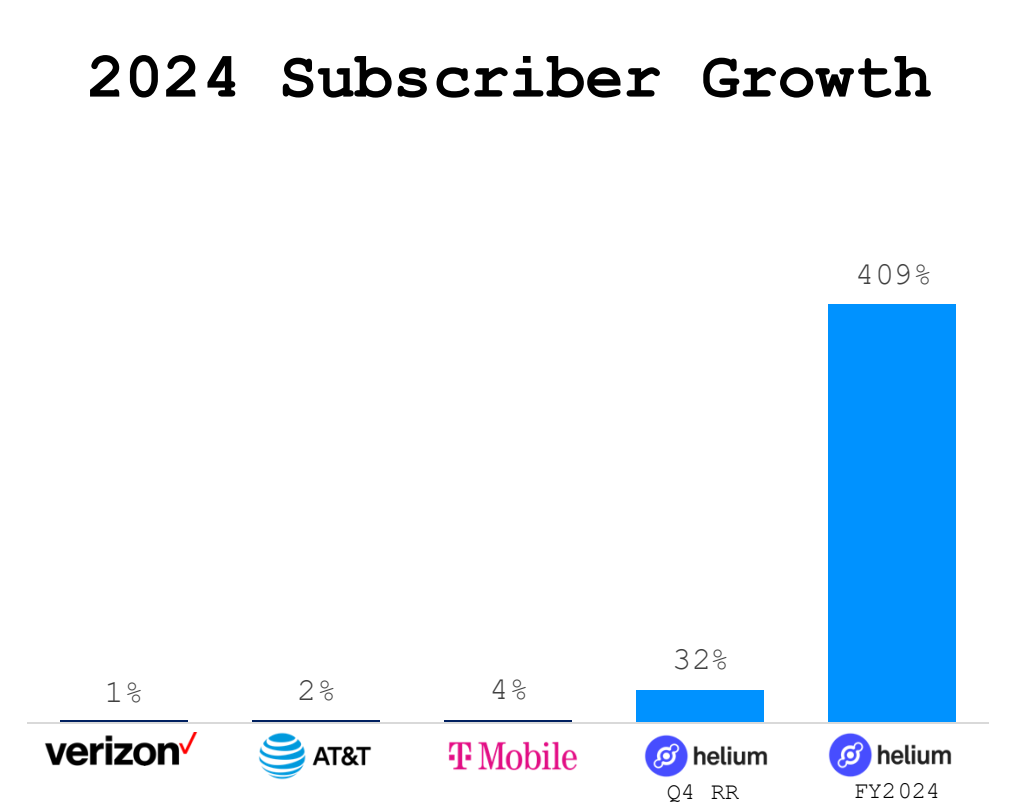
2024 Subscriber Growth

- Verizon: 1%
- AT&T: 2%
- T Mobile: 4%
- helium (Q4 RR): 32%
- helium (FY2024): 409%

Valuation per Subscriber

- MVNOs: $310
- verizon: $1,150
- AT&T: $2,300
- T Mobile: $3,300
- helium: $10,000

MNOs: $2.3k

MVNOs: $310

Messari

At Q4'24 pace, Helium investors are paying for 5 years of forward growth to 500k subs.

For investors who believe subscriber growth will re-accelerate back to Q2'24 levels, **HNT at current prices is an MHNO trading like MVNO** on a 5-year time horizon.

Helium Forward Valuation per Subscriber

	Run-rate	FY1	FY2	FY3	FY4	FY5
32% CAGR (dark blue)	$10.0k	$7.7k	$5.9k	$4.6k	$3.5k	$2.7k
100% CAGR (light blue)	$10.0k	$5.0k	$2.5k	$1.3k	$0.6k	$0.3k

MNOs: $2.3k
MVNOs: $310

Projected Subscribers						
	125k	165k	218k	288k	378k	500k
	125k	250k	500k	1m	2m	4m

■ 32% CAGR   ■ 100% CAGR

Messari
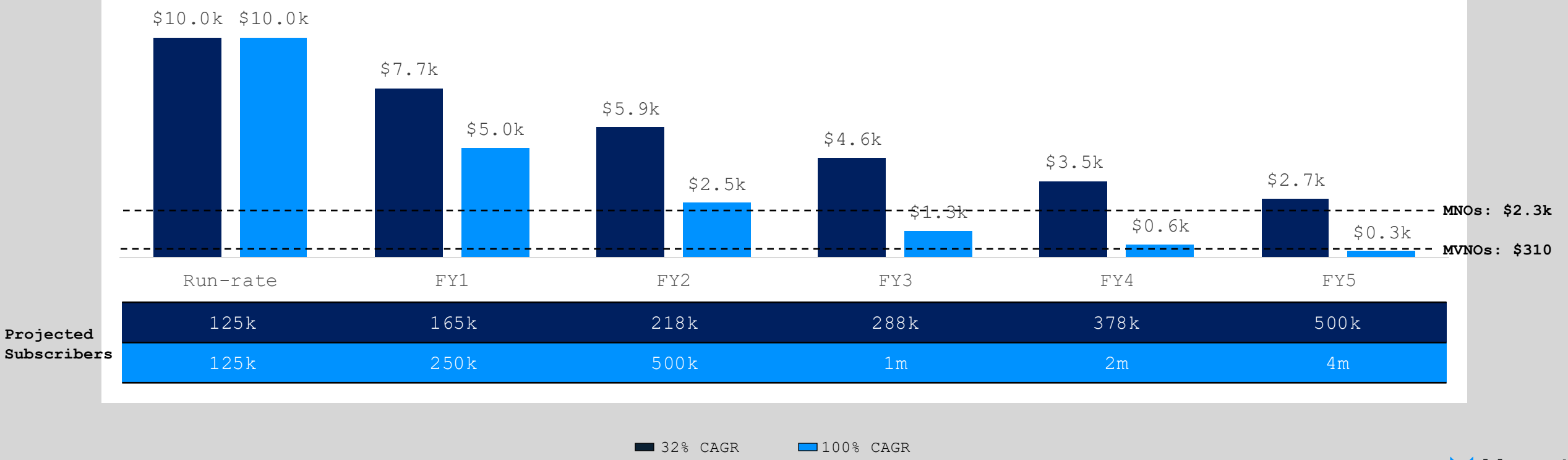
Dawn is taking a solar-like approach to the $100B+ home internet market.

DAWN's testnet network spans 10+ datacenters and covers 1.5m+ homes in the US with high-speed wireless internet, and is expanding to Africa and Latin America in 2025.

How It Works

Homeowners finance a large up-front investment (~$20k) to secure their long-term **energy** supply, earning a return in the form of lower monthly bills and demand response/VPP rewards.

Homeowners finance a modest up-front investment (~$200) to secure their long-term **internet** supply, earning a return in the form of lower monthly bills and rewards for sharing internet.

[Full Messari Report on DAWN Here](#)

Why Now

✓ **High-frequency spectrum.**

In 2020, the FCC opened up the 6GHz band for unlicensed use, enabling independent ISPs to deliver high-speed home internet over spectrum that had previously been reserved for telcos.

✓ **Software-defined radios.**

Starting around 2023, high-performance SDRs became powerful enough to provide gigabit-speed point-to-multipoint internet links from one transmitter to many receivers at once.

✓ **AI-driven networking.**

Telcos are undergoing a fundamental change as big as the shift from analogue (1G) to digital (2G) as core network functions shift from being controlled by static software (5G) to being controlled by dynamic AIs (6G).

Source: Cipher Research, Messari, EV3 research.

DAWN coordinates every piece of the last-mile internet stack.

DAWN coordinates last-mile internet traffic from the instant data packets leaves the datacenter to the moment it reaches your phone or laptop, and back.

Datacenters & ISPs

Provide wholesale internet.
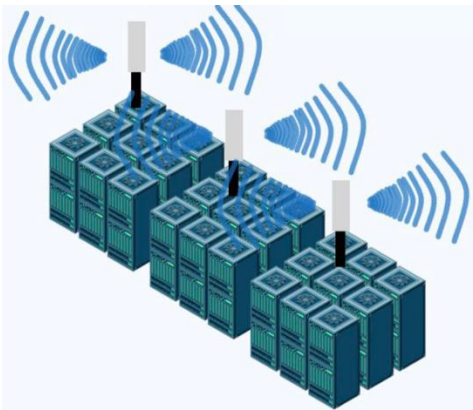
Robotic Routers

Receive retail internet.
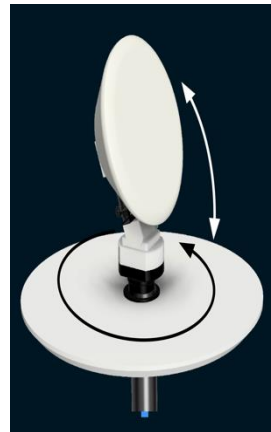
Browser Extension

Validate internet connectivity.
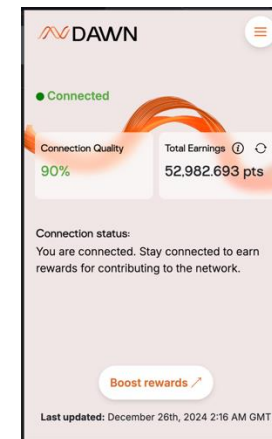
DePIN Edge Multi-miner

All-in-one network infrastructure.

Wireless | Compute | Positioning | Storage

| 10+ datacenters | 10k+ subscribers | 2m+ validators | 2025 launch |

Messari
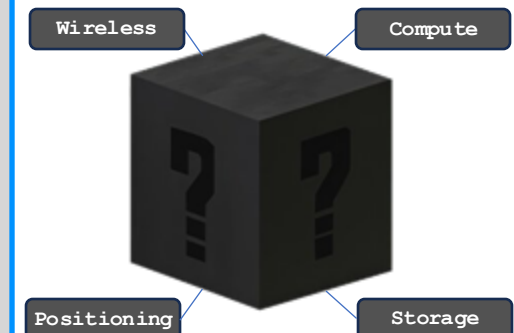
As backhaul converges, the <u>last-mile</u> becomes the most valuable part of telco networks.

With technologies like Starlink, dark fiber and point-to-multipoint expanding backhaul capacity at a blistering pace, **defensibility will be had in the last-mile of networking.**

Internet Stack

First-mile

LEO Satellites
+ Broadest coverage area
- OK speed & reliability
- High costs

$350 up-front plus $120/mo for 25-100 Mbps

STARLINK

VS

Dark Fiber
+ Best speed & reliability
- Limited coverage
- High costs

$450 up-front plus $50/mo for 300 Mbps

fios by verizon

VS

Point-to-Multipoint
+ Lowest costs
- Good coverage
- Good speed & reliability

$0 up-front plus $30/mo for 100 Mbps

(andrena)

Last-mile

Real estate owners - e.g., single- & multi-family homes, offices, commercial buildings - install antennas to receive & propagate internet connectivity.

Source: company websites, blogs and social media, Cipher Research, Messari, EV3 research.

Messari
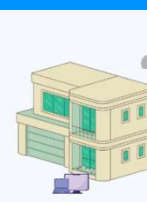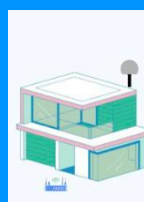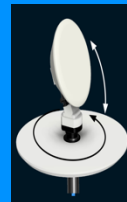
Your kids will laugh at the <u>insane prices</u> we pay for internet today.

Together, Helium and Dawn have an opportunity to **save Americans >$200B/yr by reducing internet costs** – of mobile and fixed internet, respectively - by 60-70%.

Mobile Internet

$73

>70% discount

$20

Average US monthly cell phone bill

Helium Mobile™
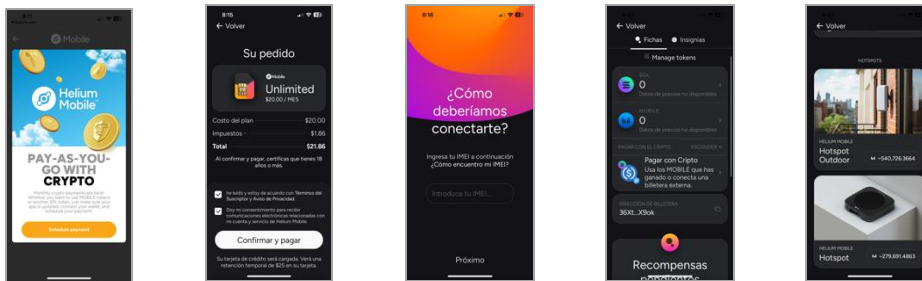
Fixed Internet

$78

>60% discount

$30

Average US monthly home internet bill

andrena DAWN
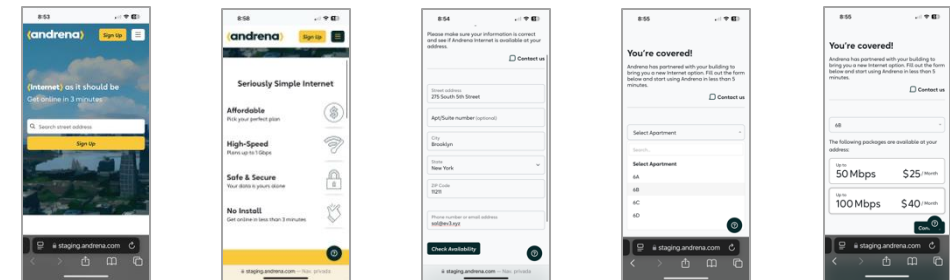
In addition to cost savings, signing up for Helium & Andrena takes <5 mins vs hours or sometimes even days for legacy telcos.

Messari

WiFi Map expanded from free WiFi & eSIMs to a <u>full-stack map of public amenities</u>.

WiFi Map's community of **80k+ monthly active contributors** has begun crowdsourcing a global map of public restrooms, water fountains, landmarks and other amenities.

Supply-side

Within 6 months of launch, WiFi Map's community mapped 20k+ public restrooms & water fountains and 100k+ photos & reviews across 100+ different countries.
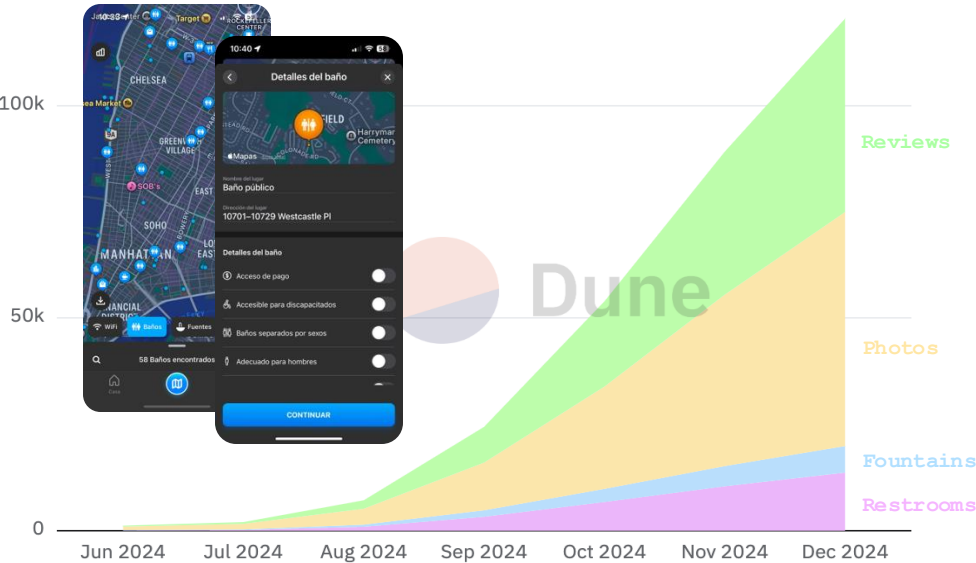
Demand-side

Real-time maps of public amenities are highly useful & valuable to a number of industries, with potential to generate >$1m ARR in the near-term and >$100m long-term.

	Near-term potential	Long-term potential
Amenities	10,000	1,000,000
Developers	100	1,000
Requests per dev[1]	10k/day	50k/day
Cost per call[2]	$0.003	$0.006
ARR	**>$1m**	**>$110m**

Illustrative buyers of public amenities map data:

Uber lyft	Google Maps / Maps	STRAVA RUN	amazon FedEx
ridesharing	*mapping*	*fitness*	*logistics*

Messari

Other hardware-based DeWis focus on either neutral-host CBRS and/or WiFi rails.

CBRS is an emerging wireless standard that demands **premium economics in high-traffic areas** ($0.50/GB), while WiFi rails are **ubiquitous but difficult to monetize** ($0.05/GB).

XNET

- Co-founded by Rich DeVaul, former Google X executive working on Project Loon

- 1.1k active nodes with 0.5 TB daily data transfer

SOLANA
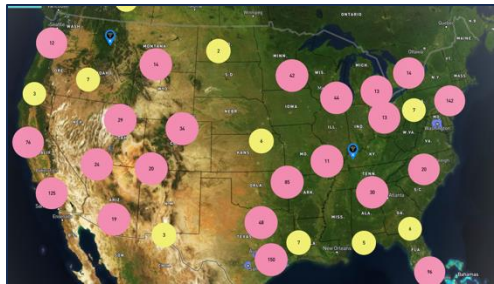
WORLD MOBILE

- Founded by Micky Watkins, former founder of Israeli VOIP platform Yallo

- 6.5k active nodes with 375 TB daily data transfer

BASE

uplink
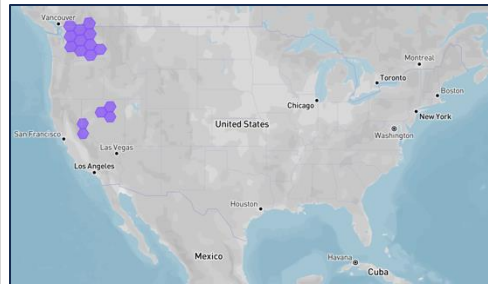
- Co-founded by Carlos Lei, former Forbes 30-under-30 recipient in 2021

- 11k active WiFi hotspots & 145k pre-registered

AVALANCHE

Roam
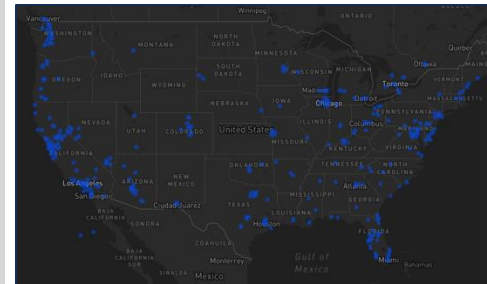
- Co-founded by Jeffrey Manner, former venture investor at Galaxy Digital

- 1m active WiFi hotspots & 82m user check-ins

SOLANA

CBRS

WiFi

Messari
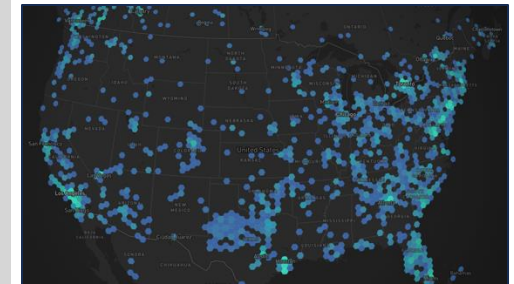
Software-based approaches to DeWi can scale even faster than physical devices.

Software-based DePINs tend to have **thinner margins** than hardware-based peers, but can scale much faster and with less capital investment.

OXIO

- Oxio's MVNO-as-a-service platform enables enterprise brands to offer custom white-labeled mobile plans to their customers

- Leverages distribution from retailers, fintechs, artists, etc. to avoid marketing costs that hinder most MVNOs

- Partners:

Rappi   verizon   telcel   AT&T
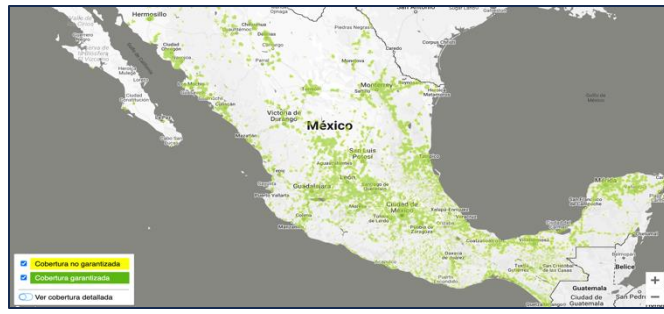
$50m+
raised from VCs

DENT

- Dent's eSIM-as-a-service platform enables mobile app developers to offer white-labeled eSIM plans in 125+ countries

- Leverages distribution from 3rd-party app developers to avoid marketing costs that hinder most MVNOs

- Launched a blockchain built for telecom services, DENTNet, in March 2024

$DENT token price since TGE

$120m+
FDV

Telegram Apps

DePINSim & EvaRoam are Telegram mini-apps enabling users to buy eSIM plans in seconds.
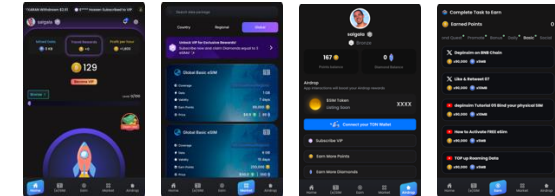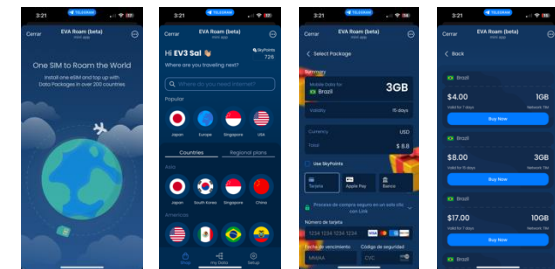
200k+
monthly active users

Messari

Distributed energy is among the most critical coordination challenges for humanity to solve.

Without fixing the **fundamental problems in our electric grids**, energy consumption per capita will stagnate and hinder technological & economic progress.

Generation Capacity vs Interconnection Queue

The backlog of US power generation capacity sitting on the sidelines waiting to connect to the electricity grid has grown from half to double total generation capacity since 2010.
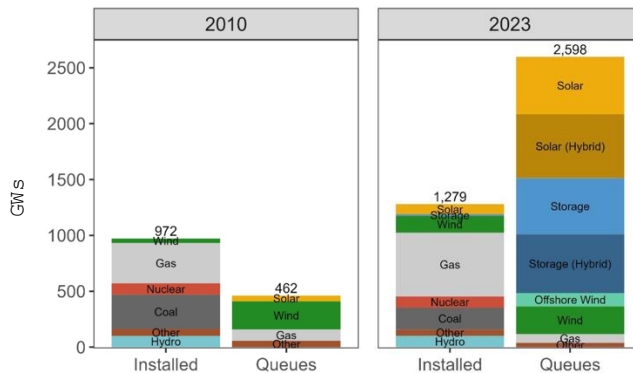
Interconnection Time Request-to-Operational

It takes 2.5x longer for new power plants to connect to the US energy grid today than it did twenty years ago.
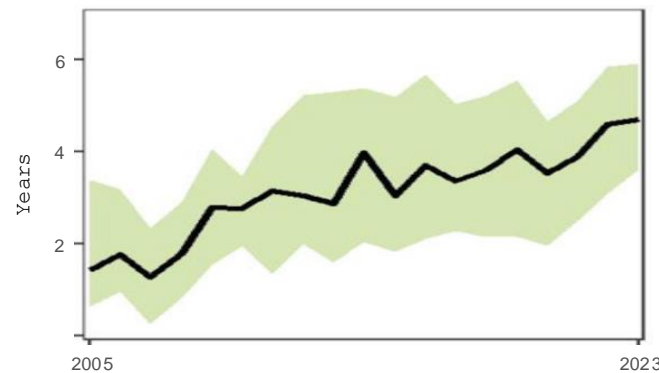
Residential Solar Hard vs Soft Costs

Only half of residential solar costs are attributable to hardware & installation labor… the rest goes to administrative overhead, financing costs, taxes & corporate margins.
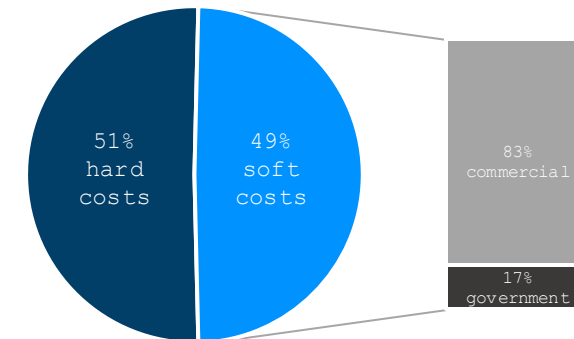
Full Messari Report on DePIN's Energy Sector Here

Messari

Daylight creates a <u>decentralized energy flywheel</u> through decentralized incentives.

Daylight scales distributed energy by **incentivizing & coordinating across the energy entire stack,** from installation to financing to orchestration.

How it Works

Daylight's novel Proof-of-Flexibility (PoF) consensus mechanism rewards smart energy devices with $GRID for committing to providing flexible energy capacity to the grid in the future; energy companies redeem $GRID for access to the network's flexible energy capacity.
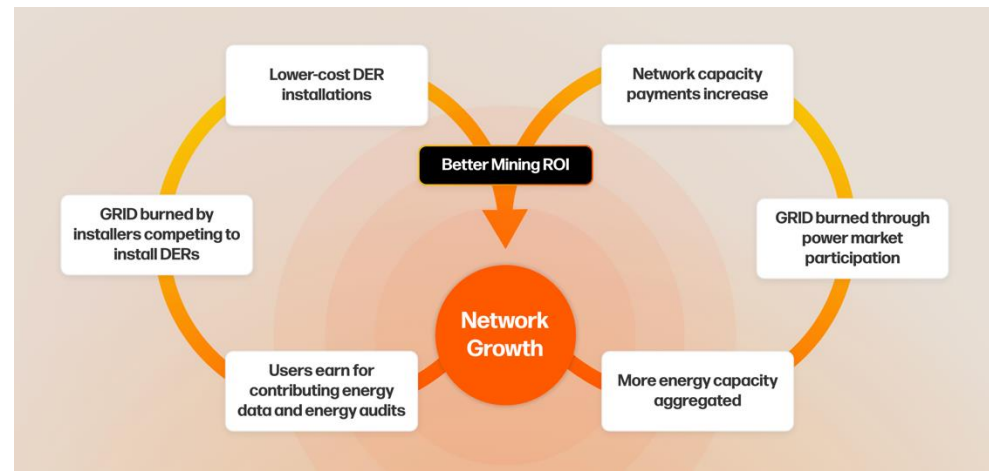
Mobile App
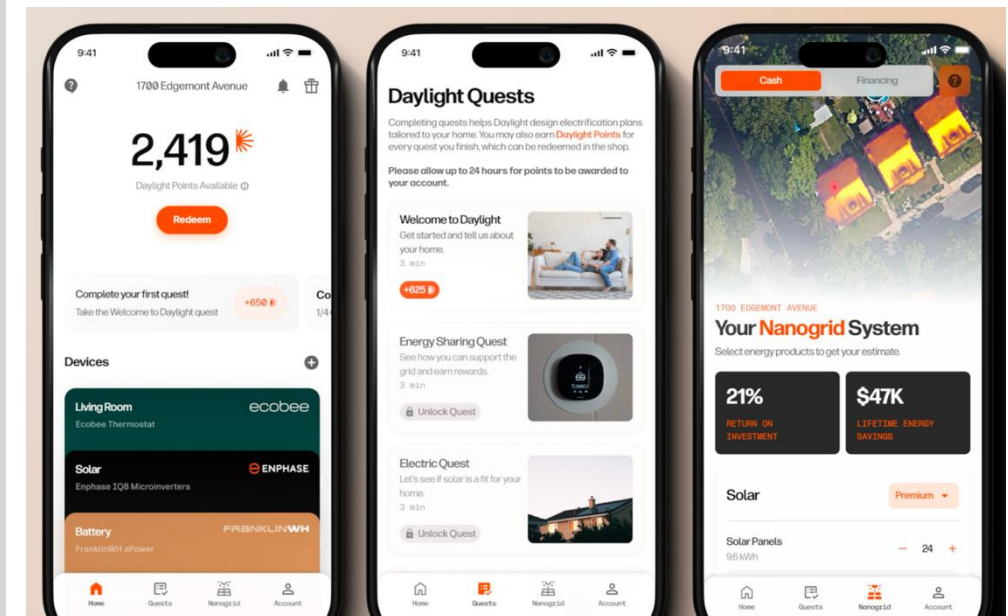
$GRID is the first <u>energy-backed currency</u> touching every part of the energy value chain.

$GRID is the **settlement & consensus layer for physical and financial distributed energy markets,** using staking & burns to back a currency supported by a $1T/yr TAM in the US.

Physical Energy Markets[1]

Capacity: $500B+ TAM

Energy businesses - e.g., utilities, REPs, power traders - redeem $GRID to access the network's flexible capacity: 42% burned, 42% to miners, 8% to medallions.

Marketplace: $50B+ TAM

End-users redeem $GRID to get discounts on home electrification upgrades (e.g., solar, batteries, HVAC) from Daylight's network of installers: 100% burned

Data: $15B+ TAM

Energy businesses redeem $GRID to access the network's proprietary data, including energy consumption, forecasting and device audits: 100% burned.

Financial Energy Markets[2]

Trading: $400B+ TAM

Traders stake $GRID to mint & trade medallions & speculate on mispricings in regional energy capacity pricing, enabling more complex derivatives on top.

Insurance: $15B+ TAM

Natural hedgers, e.g. energy businesses, insure their offchain capacity commitments by accessing capacity from miners who stake $GRID for boosted rewards.

Validation: 7.5% of emissions

Network validators stake $GRID to participate in proof-of-flexibility / proof-of-location / proof-of-device uniqueness and earn validation rewards.

$500B/yr TAM

$500B/yr TAM

Glow incentivizes development of <u>new solar farms</u> with astonishing speed & efficiency.

Glow uses carbon credits and other subsidies to **accelerate the deployment of solar farms** that are on the cusp of being independently profitable.

How it Works

Glow's hybrid PoW/PoS-like mechanism incentivizes solar farms to produce carbon credits – instead of SHA-256 hashes – to compete for a global stablecoin-denominated rewards pool.

Glow auctions off the credits & uses the proceeds to burn $GLW.
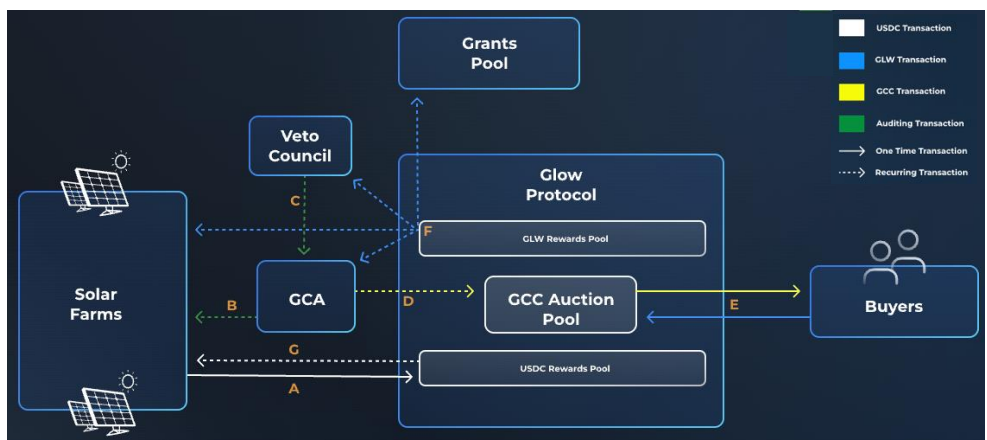
Bull vs Bear Views

- **Massive global demand for renewables,** especially solar: >25% CAGR in the past decade

- **Novel protocol architecture:** uniquely incentivizes *marginally-unprofitable* solar farms for maximum impact

- **Onchain stablecoin pool:** drives reflexive TVL growth & future revenue opportunities
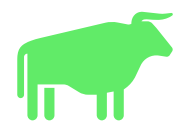
- **Unproven market for solar-based carbon credits:** not included in traditional credit frameworks

- **High barrier-to-participation:** only new solar deployments can earn rewards, after making a $10k-$1m staking deposit

- **Uncapped token supply:** 230k GLW per week minted in perpetuity to miners/validators/governance
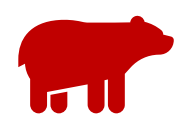
Glow's 2024 growth was outstanding… even outpacing Bitcoin in its early years.

Bitcoin took 23 months to grow hashrate by >5000x… Glow achieved **similar growth in carbon credit production in only 14 months.**[1]

Carbon Credits(tCO$_2$e/week)

Glow's run-rate (annualized) carbon credit production grew from zero to >10,000 in fourteen months.[2]

+5000x

14 months from Nov'2023
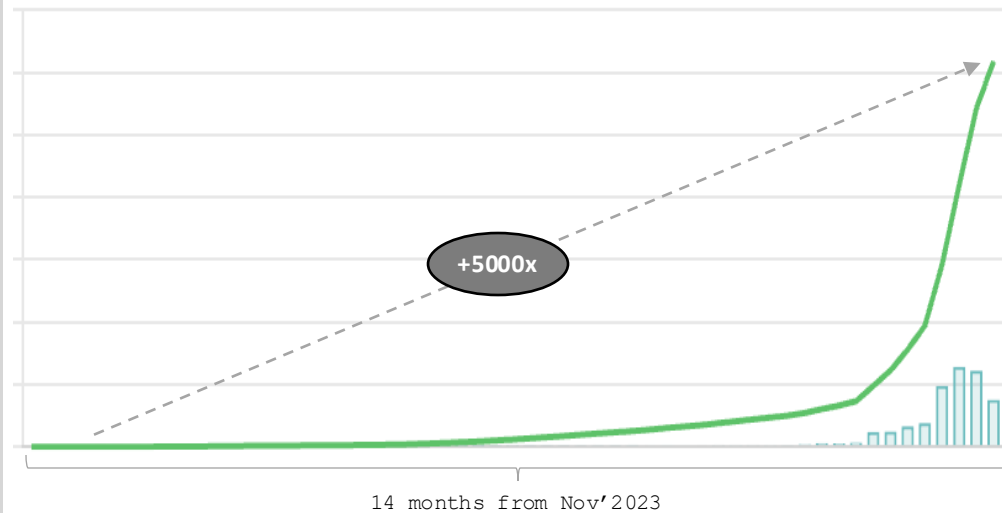
Hashrate (H/s)

Bitcoin's run-rate (annualized) hashrate grew from zero to >70 GH/s in twenty-three months.

+5000x

23 months from Jan'2009

Messari
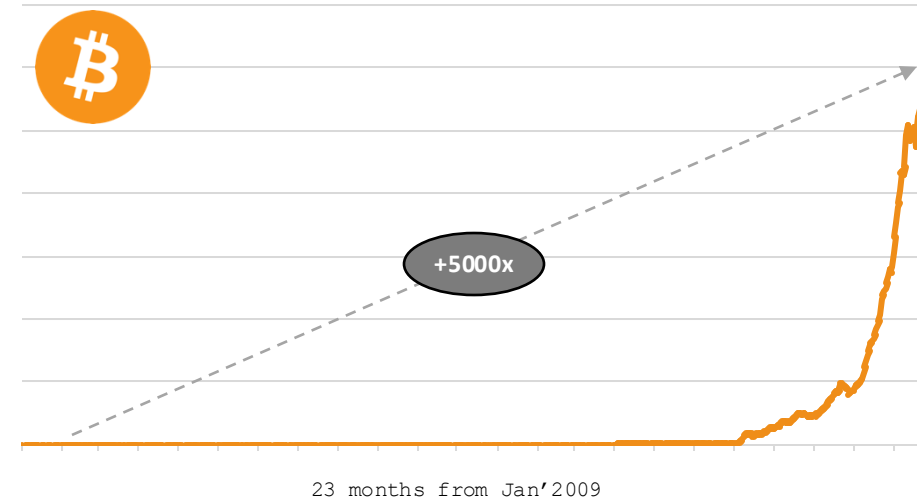
Energy DePINs can generate <u>substantial</u> <u>onchain revenues</u> relative to their user base.

Given the nature of renewable energy equipment, participants in energy DePINs can contribute **meaningful onchain economic activity from day one** ($20k+ per household).

Glow

The average Glow miner deposits $58k in stablecoins into the protocol, contributing to fast TVL growth.

Median	Average	Maximum
$17k	$58k	$788k
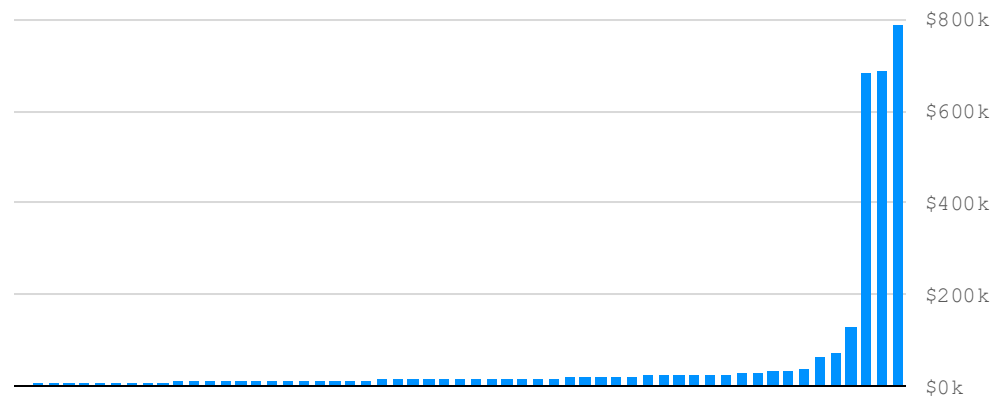
Glow protocol fee per farm distribution

Daylight

The average American homeowner can spend >$40k on home electrification upgrades with positive return-on-investment.

Solar panels | Battery | HVAC | Water Heater | Washer & Dryer | Fridge & Dishwasher | EV Charger | Total

$20k | $5k | $5k | $3k | $3k | $3k | $2k | $41k

Messari
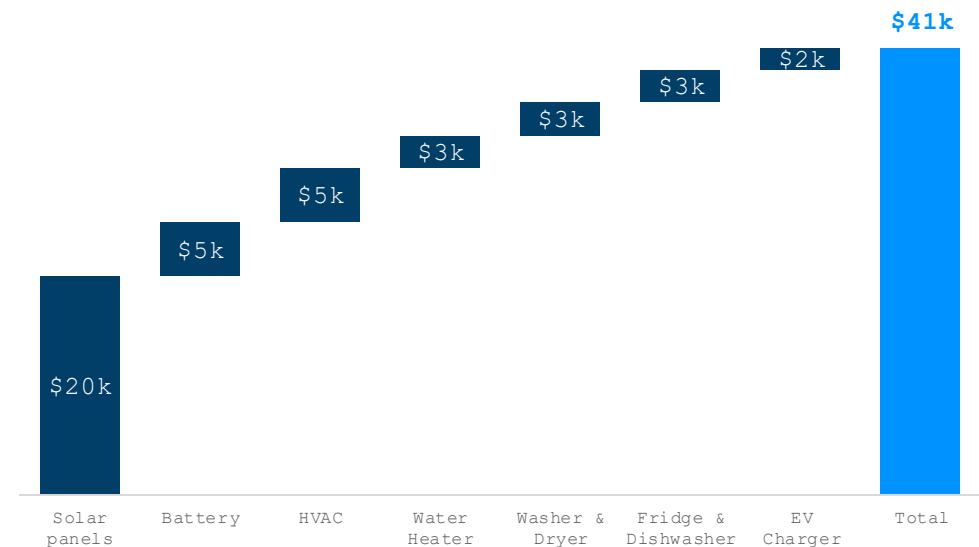
Other DeGENs focus <u>outside the US</u>, where solar & p2p energy markets are more mature.

DeGEN, or Decentralized Generative Energy Networks, is another name for the DePINs that incentivize the buildout of renewable energy generation and/or storage.

UK

PROJECT ZERO

- Co-founded by Alan Chang, former chief revenue officer & 5th employee at Revolut

- Raised $78m in 2022 primarily from web2 VCs, followed by a $12m web3 round in 2024

- Operates a full-stack energy service provider for homeowners & businesses in the UK, with 18MW of solar & wind generation capacity and 100MW more under construction

- Reinvests 100% of profits back into renewable energy projects

Ribbit Capital · CREANDUM · Accel · LOWERCARBON · BOX GROUP

$90m+
raised from VCs

Asia

STARPOWER

- Co-founded by Laser Ding, former director at Wanxiang Group

1.5M+	16,197	80k+	5k+	781+
Wallets Registered	Devices Activated	APP Users	Daily Active Users	Cities

Framework · EV · SOLANA VENTURES · BASIS Ventures · FENBUSHI CAPITAL · ALLIANCE · bitscale capital · HASHKEY GROUP
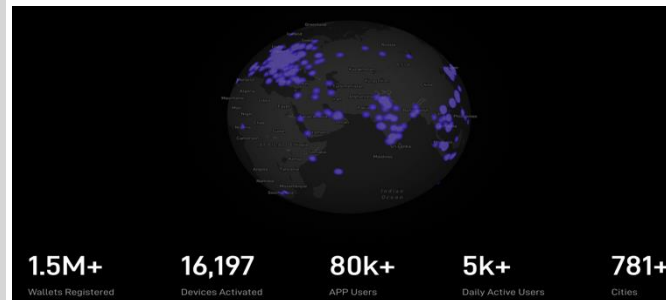
16k+
active devices

Europe

Sourceful Energy

- Co-founded by Fredrik Ahlgren, PhD in maritime science & engineering

Borderless · Helium Foundation · SOLANA

75+
active devices

Source: company websites, blogs and social media, network explorers, Crypto-fundraising.info, Messari, EV3 research.

Messari
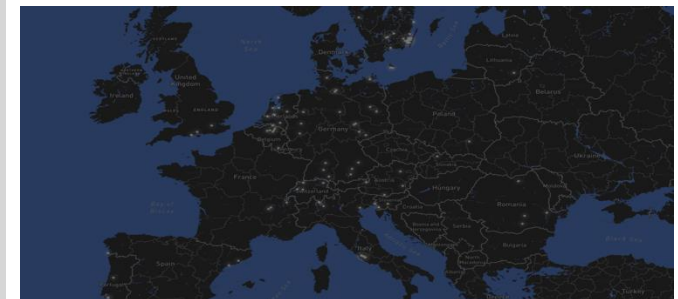
DeGENs are even <u>coordinating EVs</u>, i.e. batteries on wheels, with onchain incentives.

Users want **consistent, reliable & transparent access to EV charging stations** before ditching combustion cars… but shareholders of web2 EV chargers have suffered to date.

Web2 EV Charging

<u>Users want better EV charging solutions…</u>

- **Coverage:** the US needs >10x growth in charging stations by 2030 to support the growing fleet of EVs
- **Real-time data:** >20% of EV chargers are not functioning at any given point in time, creating frustrated drivers
- **Aggregation:** the average EV driver regularly uses 6+ EV charging apps, each with their own password/payments/etc.

<u>…But owning chargers has been a terrible business.</u>

5-year returns:
S&P: +85%
EVGo: -57%
Chargepoint: -89%
Wallbox: -96%

S&P500

EVgo
-chargepoint-
wallbox
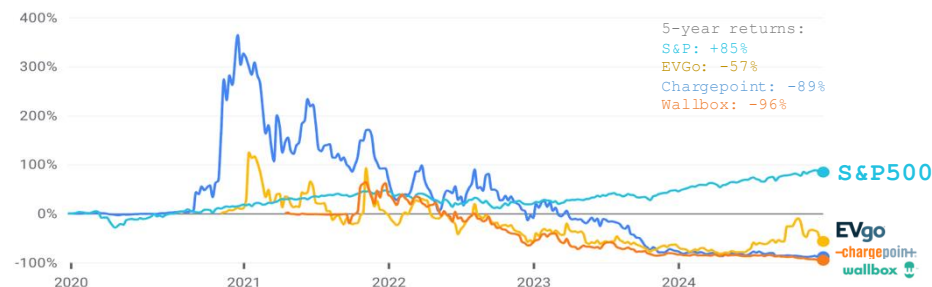
Web3 EV Charging

<u>DePINs enables users to share their own chargers…</u>

DeCharge launched The Beast, a 7KW chargers ideal for motorbikes, scooters and other 2-wheel vehicles deploying across India, Dubai & SE Asia in Q1'25.

<u>…& get paid for going about their daily routines.</u>

POWERPOD

PowerPod's Pulse 1 EV charging adapter allows drivers to connect to a wider range of chargers while earning rewards for validating charger status in real-time.

Compute is the most mature, most valuable, & most competitive category of DePIN.

GPU-focused DePINs have attracted **2x the funding of storage-focused peers in private markets and 2x the valuation of storage networks** in liquid markets.

GPU-Focused vs Storage/Full-stack Compute Networks

GPU-focused

Storage or full-stack focused

Live token

GPU-focused (Live token): Render, akash, livepeer, IO.NET, NODEAI, NOSANA, $9B+ market cap, Aethir, golem

Storage or full-stack focused (Live token): Filecoin, arweave, STORJ, OORT, sia, CRUST, JACKAL, Flux, AIOZ, ScPrime, GENESYSGO, Aleph.im, $5B+ market cap, ocean, fluence

Pre-token

GPU-focused (Pre-token): prodia, EXO, COMPUTE LABS, salad, GPU.NET, Axlflops, GAIB, Kuzco, Celium, Exabits, Hyperbolic, Spheron, NodeShift, nineteenai, $90m+ raised, NETWORK3, Heurist

Storage or full-stack focused (Pre-token): IRYS, SPACE AND TIME, Impossible Cloud, THREEFOLD, denet, Safira, 4EVERLAND, Openlayer, Chakra, CARV, AKAVE, $50M+ raised, Gateway, Hyperline

Messari

GPU networks trade at a premium because of their structurally higher utilization.

Unlike for storage & general-purpose compute, intense developer demand for accelerated computing means miners on **GPU DePINs are busy with real workloads most of the time**.

Network Utilization

Bar chart showing network utilization percentages:
- akash: 76%
- NOSANA: 50%
- akash: 16%
- akash: 12%
- CRUST: 0.9%
- Filecoin: 0.4%

Legend: GPUs | CPUs | Storage

Messari
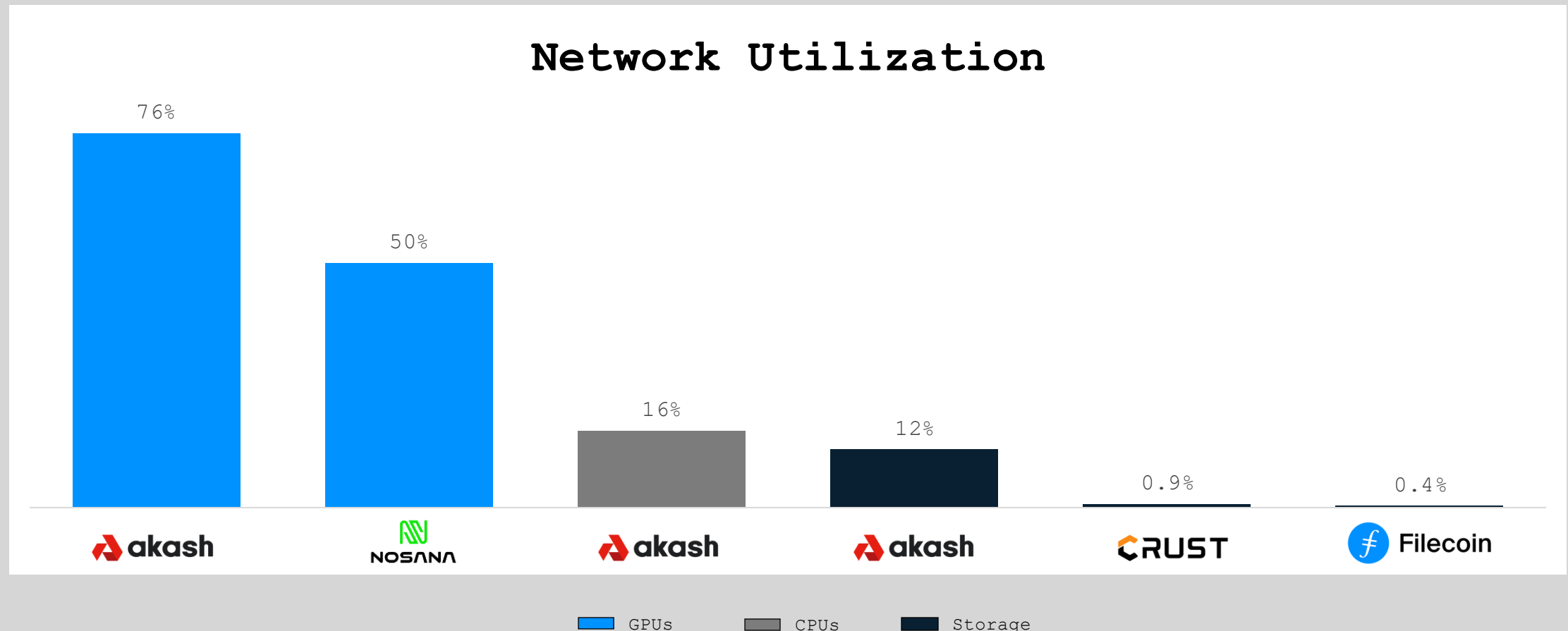
Paradoxically, the <u>fastest-growing GPU DePINs</u> are also the cheapest ones.

Of the three decentralized GPU networks with onchain revenues, Akash was both the fastest-growing & also the lowest-valued network on a revenue multiple basis.

Revenue Growth[1]

- akash: 325%
- Render: 325%
- livepeer: 185%

Token Price

- akash: 17%
- Render: 63%
- livepeer: 110%

Revenue Multiple[2]

- akash: 177x
- Render: 469x
- livepeer: 1,993x

Messari
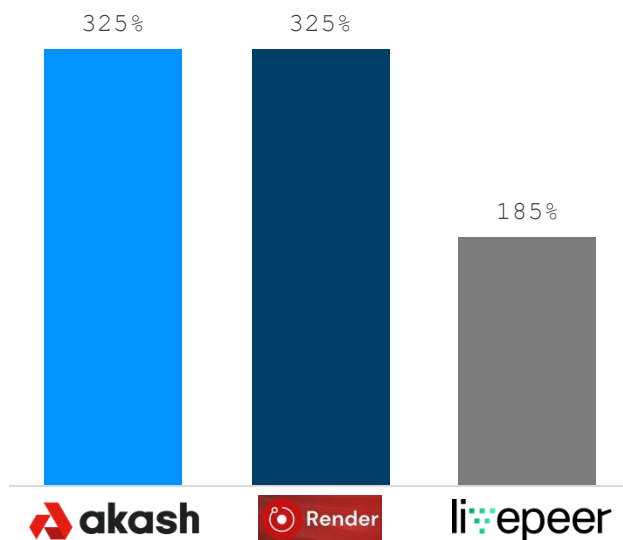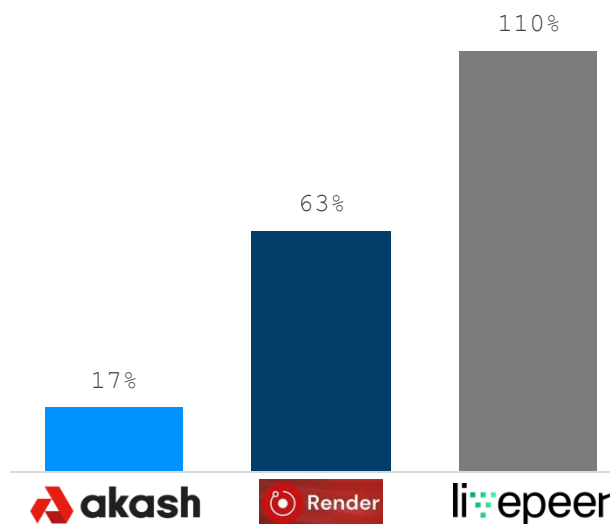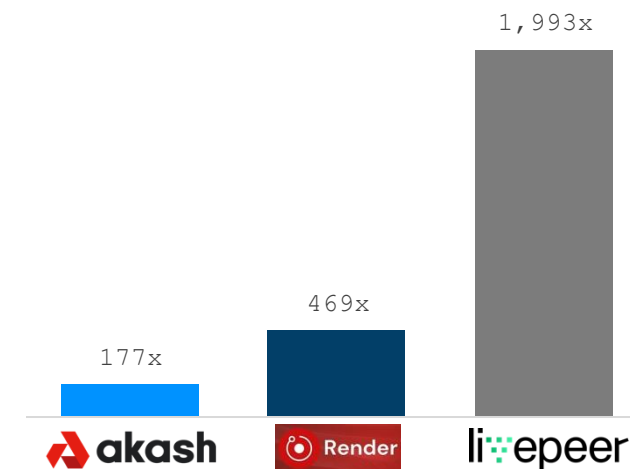
CDNs are the new meta: we expect 20+ decentralized CDN project launches in 2025.

CDNs compete to attract edge compute & bandwidth capacity in order to serve **latency-sensitive applications** like content streaming, data scraping and spatial computing.

GPUs in 2024

New high-growth use cases discovered:

LLM training	Big data & analytics	Gaming & rendering
LLM inference	Physics research & simulations	Crypto mining

Fragmented supply of core resource:

Energy — GPUs — Training Data
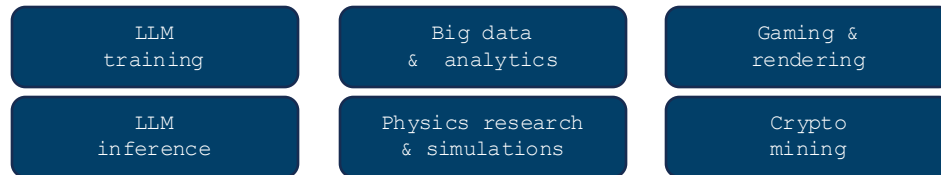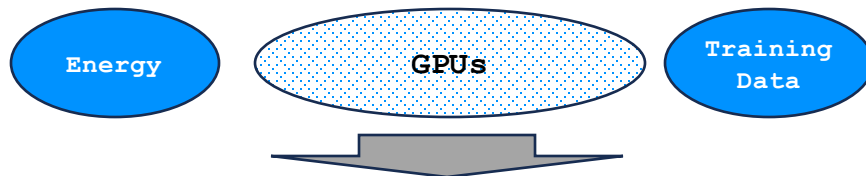
$130m+ raised by **20+** VC-backed projects in 2024

CDNs in 2025

New high-growth use cases discovered:

Content streaming	Data scraping	Robotics & autonomous vehicles
AR/XR/VR experiences	Serverless functions	Network validation

Fragmented supply of core resource:

Energy — Edge Servers — IP Addresses
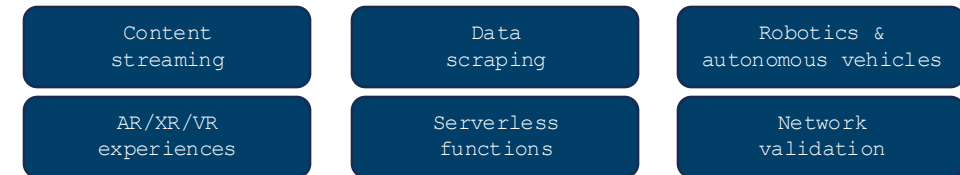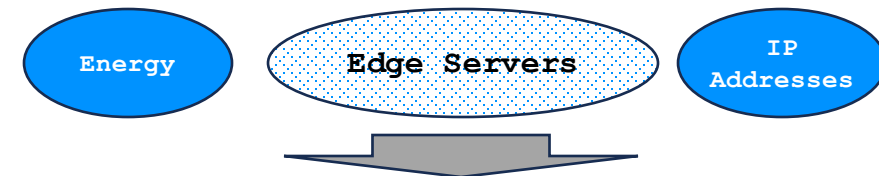
Prediction: **$100m+** raised by **20+** VC-backed projects

Messari

The battle for CDN capacity will be intense, and is already well underway.

Browser extensions - powered by referral programs and points/airdrop programs - were the **biggest funnel for DePIN node growth in 2024,** with 15+ projects launching them.

DePIN Browser Extensions

DAWN grass™ bless Openlayer Gradient nodepay MeshChain Kaisar toggle NVG8 OpenLoop teneo Alliance Games interlock KLEO

Messari
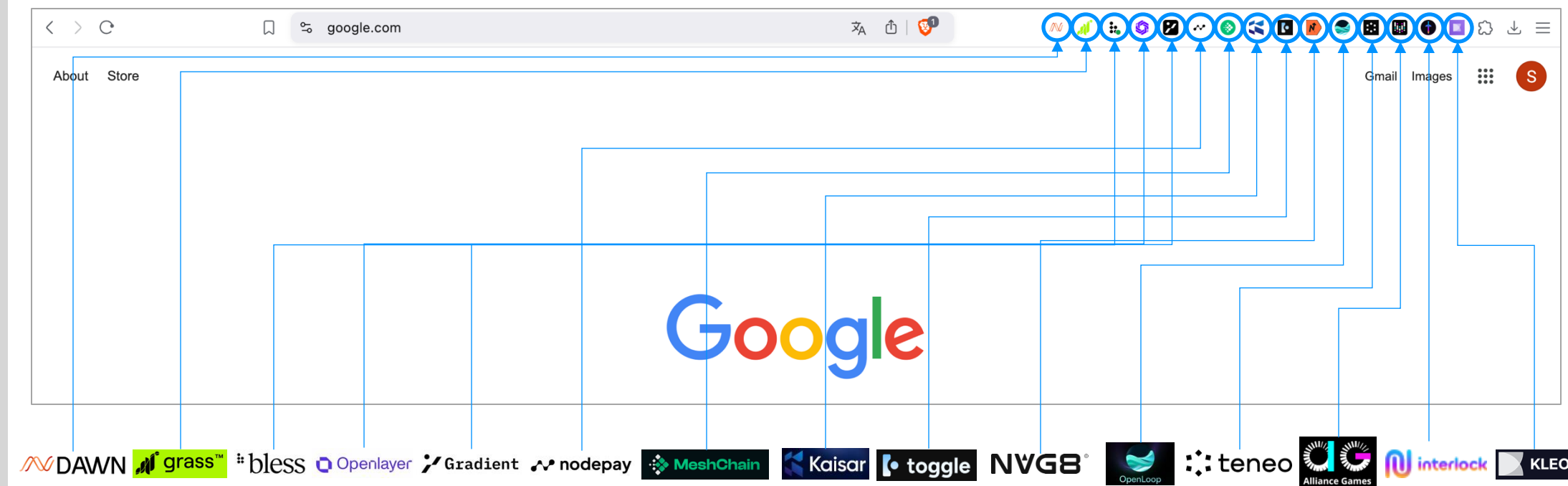
Advances in <u>private computing</u> are enabling DePIN apps that aren't possible in web2.

While scaling bottlenecks remain in the near term, privacy-focused technologies like zkTLS, MPC and FHE are bound to power the next generation of breakout DePIN apps.

Approaches to Private Computing

	zkTLS	MPC	FHE
Summary	**Zero-knowledge proofs over TLS/HTTPS traffic** enables users to trustlessly verify data from any web2 platform.	**Multiple parties computing over shared data** without any single party being able to reconstruct the entire operation.	**Fully-homomorphic encryption** enables traditional (single-party) computation over data that has already been encrypted.
$1T Opportunity	**'Vampire-attack' web2 platforms** by rewarding their top users with outsized token incentives.	**Training AI models** on massive shared datasets of data that people aren't typically willing to share.	**Private AI inference** where both user query & model weights are private but verifiable.
Cons	**Limited verification duration** since user credentials only last as long as a TLS connection.	**5-10x communication overhead** for nodes to relay messages to each other between rounds.	**10-100x computational overhead** for nodes need to process over encrypted vs unencrypted data.
Leading DePIN	Opacity	nillion	ZAMA
2024 Fundraise	$12m — EV, archetype ventures, Finality CAPITAL PARTNERS, breyer capital, BODHI VENTURES, CSX alózcrypto	$25m — HACK VC, DISTRIBUTED GLOBAL, HASHKEY Capital	$73m — Multicoin Capital, Protocol Labs

[Full Messaari Repor on zk-TLS Here](#)

Messari

DePINs are uniquely good at <u>mass-scale data collection</u>: becoming the eyes & ears of AI.

As the returns to scale on compute starts to taper off, AI researchers are turning their attention to **data bottlenecks to drive continued improvements in model performance.**
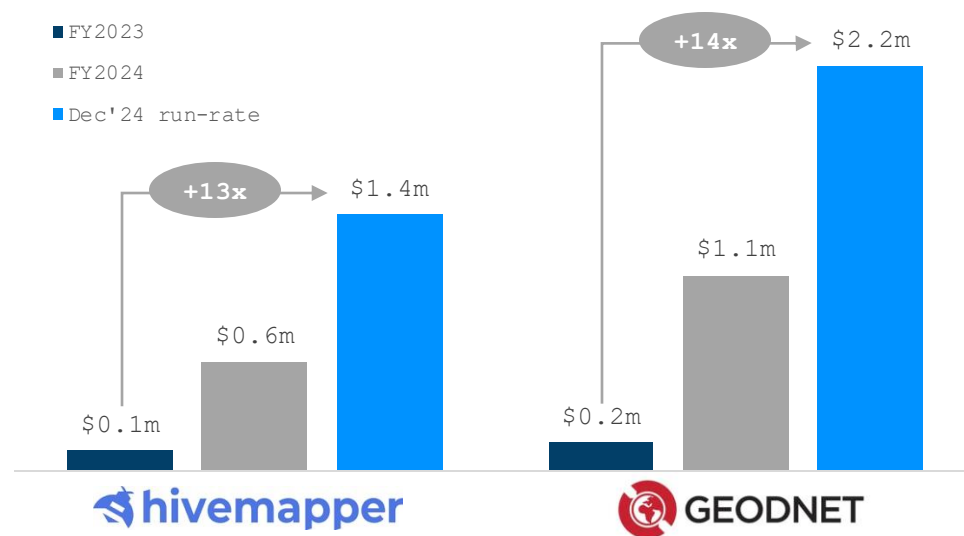

GPS
GEODNET

>10k RTK base stations

11k

Jan'24 — Dec'24

Road Maps
NATIX Network

>100m total km driven

118m

Jan'24 — Dec'24

3D Maps
over

>80k 3D maps

89k

Jan'24 — Dec'24

Speed Tests
DAWN

>2m browser extension validators

2.3m

Jan'24 — Dec'24

Health
CUDIS

>2m heart rate measurements

2.4m

Jan'24 — Dec'24

Weather
WEATHERXM

>7.5k weather station claims

7.5k

Jan'24 — Dec'24

Noise
silencio

>1.5 million noise measurements

1.5m

Jan'24 — Dec'24

Amenities
WiFi Map

>20k public restrooms & fountains

20k

Jan'24 — Dec'24

Messari

Sensor DePINs generated $1.7M revenue in 2024 (+500% YoY) with a massive acceleration in Q4.

However, **revenue growth did not necessarily translate into higher token prices** as investor token allocations began unlocking in 2024 for both Hivemapper & Geodnet.

Onchain Revenues

The two revenue-generating sensor DePINs, Geodnet and Hivemapper, grew onchain revenues by >13x from 2023 to Dec'2024 run-rate.

■ FY2023
■ FY2024
■ Dec'24 run-rate

+13x → $1.4m

$0.6m

$0.1m

+14x → $2.2m

$1.1m

$0.2m

hivemapper

GEODNET

[Full Messari Report on GEODNET Here](#)

Price & Market Cap

While market cap grew in line with annual revenues, token price appreciation lagged behind significantly suggesting that 2024 growth was mostly priced-in.

■ FY2024 Market Cap growth
■ FY2024 Token Price growth

400%

−33%

500%

127%

hivemapper

GEODNET

Messari

Building sensor networks is not for the faint of heart: the data stack goes deep.

Investors are **underestimating the difficulty – but also the defensibility** – of building global, decentralized real-time data collection networks.

Sensor Design	→	Scaling Deployments	→	Data Storage & Processing	→	Data Monetization
What type of sensors should the network use?		How should deployments be incentivized?		How should data be stored & processed?		How should data be priced & monetized?

Known Tradeoffs

Sensor capabilities
Ease of deployment — Hardware costs

Supply-side Growth
Control — Uptime

Revenue potential
Costs & latency — Contributor privacy

Demand-side usage
Decentral-ization — Onchain revenue
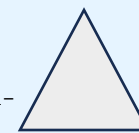
Standout Network

NATIX Network
Designed the VX360, a $350 sensor that plugs into Teslas & captures real-world driving scenario data.

grass™
Pioneered browser extension miners for DePINs, growing to >2.5m active nodes in less than a year.

hivemapper
Built a community of >100k AI trainers that label map data used by two of the top 10 global mapping platforms.

GEODNET
Grew revenues from GNSS corrections by >500% in 2024 while dedicating 80% of revenues to token burn.

Messari

Cameras are the most powerful & versatile sensors… but also the most complex.

Cameras are the **King of Sensors**: they enable an extremely diverse set of emerging use cases across robotics, AI, autonomous vehicles, augmented/virtual reality & more.

% of Information processed by Human Brain

After 300,000 years of human evolution, our sensory worldview is 80% informed by visual data, i.e. sight. AIs will evolve the same way… only much faster and with much more data.

Sight, 80%
Sound, 10%
Smell, 6%
Touch, 3%
Taste, 1%
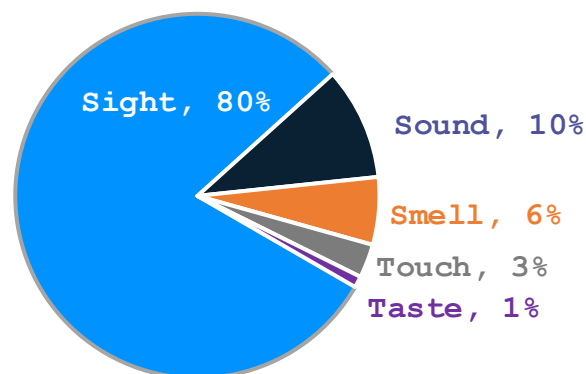
Use Cases for Video Data

NATIX Network	Real-world scenario testing for autonomous vehicles
hivemapper	Live street sign and traffic data
FrodoBots AI	Training data for sidewalk delivery robots
grass™	Training data for humanoid robots
BITMIND	Training data for deepfake detection models
AUKI	AR/XR productivity tools for grocery & retail stores
MeshMap	Generative maps for AR/XR game developers
over THE REALITY	Live AR/XR experiences for brands & marketers
Spexi	Disaster monitoring for emergency responders

Source: company websites, blogs and social media, Messari, EV3 research.

Messari

AR/XR DePINs are creating 3D spatial maps for robots + agents + humans to collaborate.

When users demand AIs to do tasks for them in the 'real world', **AIs will need to understand the world around them & their embodiment within it**: spatial intelligence.

Decentralized Machine Perception Networks

	AUKI	over THE REALITY	MeshMap	FUNES
Founded, HQ	2020 (Hong Kong)	2018 (Italy)	2024 (NYC)	2024 (Singapore)
Fundraising	$13m seed round	$3m NFT sales	$4m seed round	--
Investors	TRIBE CAPITAL, Kenetic, animoca BRANDS, EV, Maelstrom, ARKN	EV, MODULAR CAPITAL, LATTICE	EV, LATTICE, CSX alózcrypto, GSR, COLOSSEUM	--
Current Valuation	$38m market cap ($325m FDV)	$16m market cap ($27m FDV)	--	--
L1 Blockchain	BASE	BASE	SOLANA	MEGAETH
First Use Case	**Retailers**	**Marketing Agencies**	**Game Developers**	**Creators**
Traction	**$1m+ ARR deal** with Swedish grocery chain for in-store AR/XR productivity tools & robotics.	**90k+ 3D maps** & 20k+ 3D artifacts scanned by a global community of smartphone-wielding mappers.	**Two AR scavenger hunts** launched in NYC & CityChamp XR game released in public beta.	**120+ 3D maps** of historical landmarks uploaded by creators.
Customer Benefits	- Spatial communication by employees - Digitizing inventory & shelf space - Anomaly detection & cleanup response	- Unique, engaging social media content - Live events & experiences in XR/VR - Interactive product demos	- Hyper-immersive gaming experiences - Multi-player & cross-platform XR/VR - Persistent virtual worlds	- Unique, engaging social media content - Digital art & fan engagement - Virtual studios

Spatial computing is set to be THE breakout trend in DePIN in 2025.

The **convergence of consumer-grade AR/VR hardware, powerful AI models for 3D asset creation, and onchain crypto-incentives** will drive explosive growth in 2025.

2024 AR/VR Launches

Jan — XReal Air 2 Ultra launches at $700 starting price point

Feb — Apple Vision Pro launches at $3,500 starting price point

May — Google & Magic Leap announce AR partnership

Jun — Meta Quest3 launches at $500 starting price point

Sep — Snap Spectacles launch at $1,200 starting price point

Oct — Meta announces Orion prototype, next-gen AR glasses

Nov — Niantic (PokemonGo developer) launches spatial computing platform

Dec — Google announces Android XR platform & Samsung headset

Technical Approaches

	LIDAR	Photo-grammetry	Gaussian Splatting
Technology	Measures distances via laser pulses to create 3D point-clouds	Uses triangulation to turn overlapping images into 3D meshes	Uses gaussian approximations to turn images into 3D meshes
Accuracy	High	Medium	Lower
Computational Intensity	Lower	High	Medium
Measurement Cost	High	Medium	Lower
Real-time Capabilities	High	Lower	Mixed
Use Cases	AVs, Urban Planning, Mining, Agriculture	Architecture, 3D Modeling, Film/Media	Immersive AR/VR, Digital Twins, Gaming

Messari

There are natural synergies between sensor, spatial awareness & AI DePINs.

In 2025, we expect to see **more DePIN collaborations and native integrations** connecting the three layers of the spatial intelligence stack.

Spatial Intelligence Stack

Layer		Long-term Moat	Human Brain Equivalent
AI Layer: Actionable Intelligence	biττensor · Virtuals · ≡Olas	Compounding *intelligence*.	pre-frontal cortex
VPS Layer: Spatial Awareness	AUKI · over THE REALITY · MeshMap	Consensus on *real-world state*.	parietal cortex, hippocampus, dorsal stream
Sensor Layer: Data Collection	hivemapper · NATIX Network · ROVR	Proprietary access to *real-time data*.	eyes, optic nerve
Compute Layer: Data Processing	MAWARI · rndr · YOM	Proprietary access to *cheap, scalable compute*.	cerebellum

Positioning DePINs serve narrower use cases than cameras, with steeper tradeoffs.

Positioning networks can drive **trillions of dollars of downstream value for customers,** but face stiff competition amongst each other and against visual positioning systems.

Positioning Technologies

	BLE Bluetooth Low Energy	UWB Ultra Wideband	LoRa Long Range	GPS Global Positioning	RTK Real-time Kinematic	VPS Visual Positioning
Beacon Range	Low 10-100m	Very Low 10-50m	High 10-20km	Very High	High 10-20km	Medium 10-500m
Beacon Cost	Low $5-10	Medium $100-200	Medium $100-200	Free	Medium $50-100	High $500+
Positioning Accuracy	Low 1-5m	High 10-30cm	Very Low 10-100m	Low 5-10m	Very High <1cm	Very High <1cm
Receiver Cost	Very Low $0.10	Medium $10-20	Medium $10-20	Low $5-10	High $500	n/a
Use Cases	Asset Tracking Low-cost	Asset Tracking High-accuracy	Asset Tracking Outdoor	Navigation Outdoor	Robotics, Drones, Agriculture	AR/VR, Robotics, Drones, AVs
Leading DePIN	Nodle	None yet	helium	MapMetrics	GEODNET	AUKI, OVER, MeshMap

Camera-based

Messari

Sensor DePINs are tracking real-time conditions at <u>every layer of the earth</u>.

Real-time environmental data that was previously only available to governments, militaries & hedge funds is now being published by open, verifiable sensor networks.

Lithosphere
50-200km below surface

QUAKE

- Earthquake detection
- Public safety
- Academic research

<u>Earthquakes per Year Globally</u>
~1,700 average
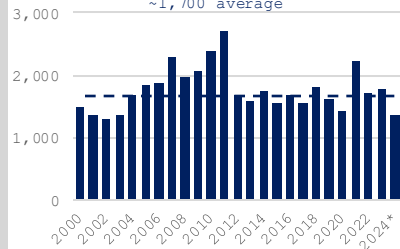
Troposphere
0-10km above surface

WEATHERXM

- Weather forecasting
- Insurance underwriting
- Power trading

<u>WeatherXM Coverage Map</u>
~6,800 active stations
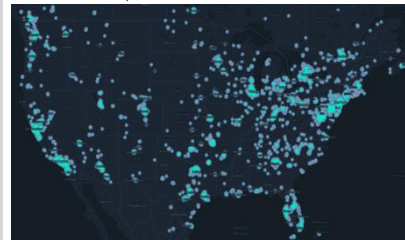
Stratosphere
10-50km above surface

Wingbits

- Air traffic management
- Environmental monitor
- Logistics

<u>Wingbits Coverage Map</u>
~1,600 active stations

Lower Thermosphere
85-500km above surface

GEODNET

- High-precision positioning
- AVs, Robotics, Drones
- Surveying, Agriculture

<u>Geodnet Coverage Map</u>
~12,000 active stations
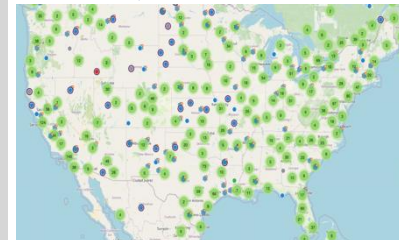
Upper Thermosphere
500-1000km above surface

SKYMAPPER

- Astronomy data
- Satellite tracking
- Academic research

<u>Unistellar Coverage Map</u>
~10,000 stations

Messari

EV

Back on earth, <u>DePIN wearables</u> are enabling health-focused communities to emerge onchain.

As medical care becomes hyper-personalized, **data from verifiable sensors** becomes the backbone for disrupting healthcare & health insurance industries with AI.

Smart
Ring

Buy Now

Smart
Wristband

Buy Now

Smart
Watch

Buy Now

Smart
Toothbrush

Buy Now

Messari

Smartphones provide troves of health data with <u>lower onboarding friction</u> than hardware.

DePINs are taking **inspiration from utility-focused fitness apps with proven product-market fit** and supercharging engagement by adding token incentives.

Fitness

GAIN

- Earn tokens for submitting workout videos
- Access AI-powered personal trainer & join group classes
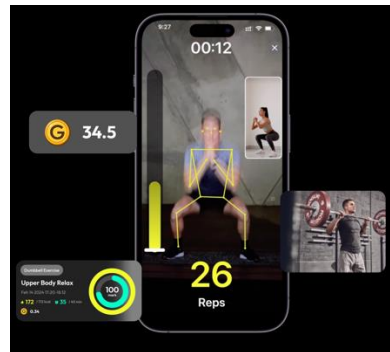
adidas **RUNTASTIC**
>180m users

Disease

BitDoctor.ai

- Analyzes facial blood flow to detect risk of disease
- Contribute your health data to improve Bitdoctor's models

SkinVision
>3m users

Steps

MOONWALK

- Earn tokens for submitting step count data
- Engage in fitness challenges with friends for tokens

Pacer
>60m downloads

Sleep

SLEEPAGOTCHI

- Earn tokens for sharing sleep data & compete with friends
- Pre-installed on 400k+ Jambo phones

Sleep Cycle
>2m users

DePIN Whitespace

Nutrition

myfitnesspal
>200m users

Women's Health

Flo
>60m users

Mental Health

headspace
>40m users

Web2 Comps:

Identity verification is a core problem limiting crypto's most promising use cases.

The growth of India Stack suggests that a **credibly-neutral digital identity layer** is a prerequisite for mass adoption of digital payments & other real-world use cases.

India Stack's Growth

India launches **real-time payments system**, UPI, the same year that Aadhaar hits 1B identities.

The number of transactions on UPI grew at a **44% CAGR from '17–'23** & likely eclipsed >200 billion in 2024.

India launches biometrics-based **digital identity** system, Aadhaar.

44% CAGR

Year	UPI number of transactions
2017	21
2018	31
2019	46
2020	56
2021	88
2022	135
2023	187

■ Aadhaar number of verified identities   ■ UPI number of transactions

Messari

This cycle's "Samcoin" is the undisputed leader in <u>verifiable human identity</u>.

Despite bans in several major countries, World (fka Worldcoin) grew to **>20m verified identities in its first eighteen months** & commands a fully-diluted valuation of >$20B.

How it Works

1. Users scan their iris with a specialized high-resolution (visual & infra-red) camera called an Orb.

2. The Orb hashes an image of the iris on local compute & deletes the image after hashing to ensure user privacy.

3. The hash is compared to a global list of hashes to check for duplicates, generating a proof-of-humanity.

4. Both the Orb operator and the end-user earn $WLD rewards for every new unique/verified human identity.

Custom Lens with Integrated Liquid Lens

NIR Optimized Coated Glass

Global Shutter Sensor

Camera Sensor Mount

Network Growth

Sam Altman, CEO of OpenAI, co-founds World & serves as chairman of Tools for Humanity, the core developer of the World network.

Acquires leading zkML company Modulus Labs.

Raises ~$100m via treasury token sales.

Launches with 1.5k Orbs in 35 cities.

Open source Orb software.

Announces Worldchain L2.

20m

10m

5m

0

2019 Jul 2023 Oct 2023 Jan 2024 Apr 2024 Jul 2024 Oct 2024 Jan 20

Banned in several countries including Portugal, Spain, Hong Kong, France, India, Kenya.

Messari

Worldcoin's success is driving innovation in competing proof-of-personhood protocols.

Proof-of-personhood solutions compete on **two sets of overlapping tradeoffs:** scanning *accuracy vs cost* & identifier *persistence vs privacy*.

Approaches to Identity Verification

	DNA	Eyes	Fingers & Palms	Heartbeat	Voice	Face	Digital Behavior
Accuracy	99.999%	99.9%	99%	95%	90%	95%	90%
Cost per scan	$100+	$5	$0.50	$0.50	$0.05	$0.05	<$0.01
Persistence	Lifetime	Lifetime	Decades	Decades	Years	Years	Weeks
Privacy concerns	Highest	High	Medium	Low	Medium	High	Low
DePIN	genomes.io	WORLDCOIN	humanity protocol	None yet	None yet	HUMANODE	None yet

The highest-accuracy identity verification techniques are also the most expensive.

Things that can't be changed are the best identifiers, but also the most vulnerable to privacy concerns.

Messari

Humans aren't the only ones that need digital identities: Anymal tracks >1.5m pets onchain.

By **partnering directly with shelters & rescues,** Petastic - the first app on the Anymal protocol - has onboard millions of pets before its public launch.

How it Works

Animal shelters & rescues partner with Petastic to automate the pet adoption funnel: pet parents simply download the Petastic app and have access to all of their pet's records.

Within Petastic's app, users get access to an AI-powered pet concierge that can access every relevant detail of the pet's identity, without users ever giving up control over their data.

Backed by

EV   Nestlé

MODULAR CAPITAL   tbv

Λ100x
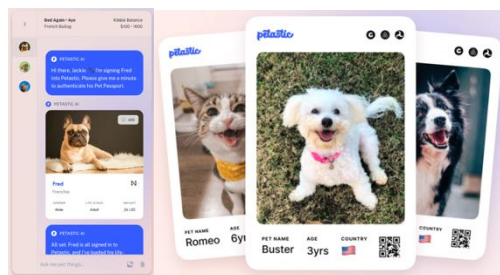
US Pet industry annual revenues	$50B+ Food	$35B+ Vets	$10B+ Medicine	$6B+ Grooming	$4B+ Insurance

Network Growth

>1.5m verified pet identities

Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan24 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan25
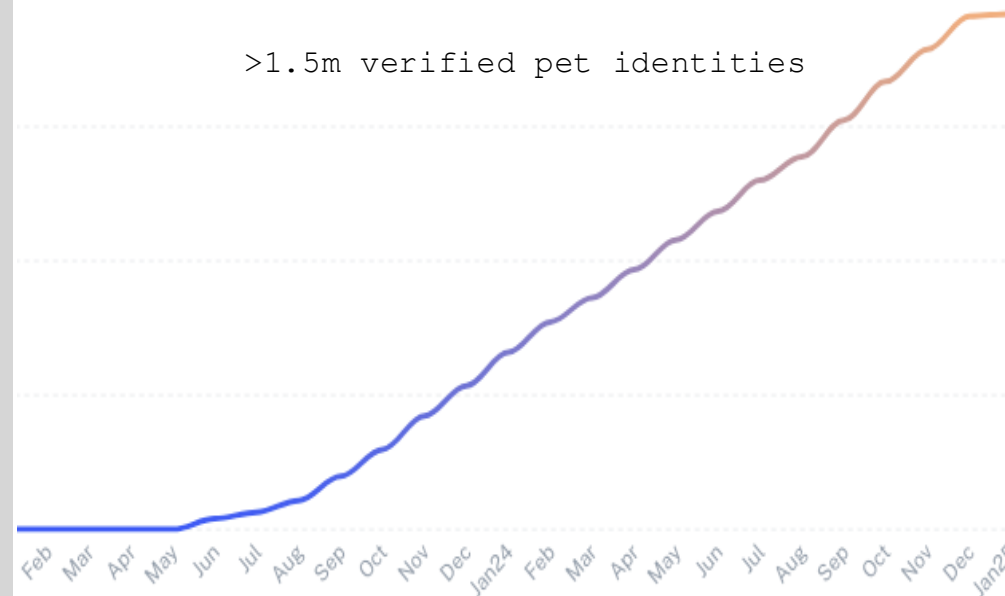
Dimo's decentralized <u>automotive ecosystem</u> connects 135k+ cars with 100+ developers.

Dimo's ecosystem scaled **meaningfully in terms of supply-side scale and developer activity in 2024,** while onchain revenues ended the year roughly flat at ~$10k ARR.

Connected Vehicles

+350%

Developer Licenses

+2,650%

Monthly Onchain Revenue

~0%
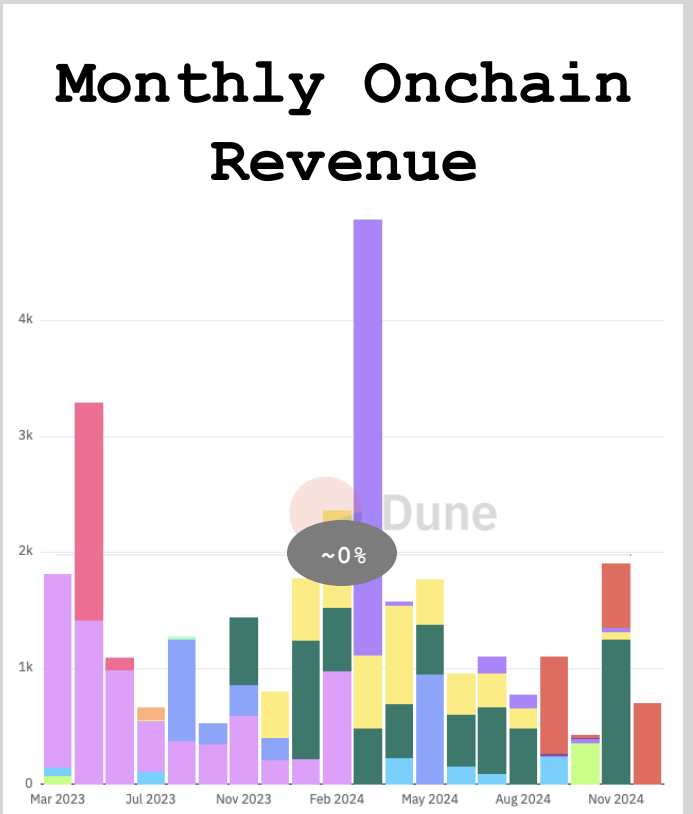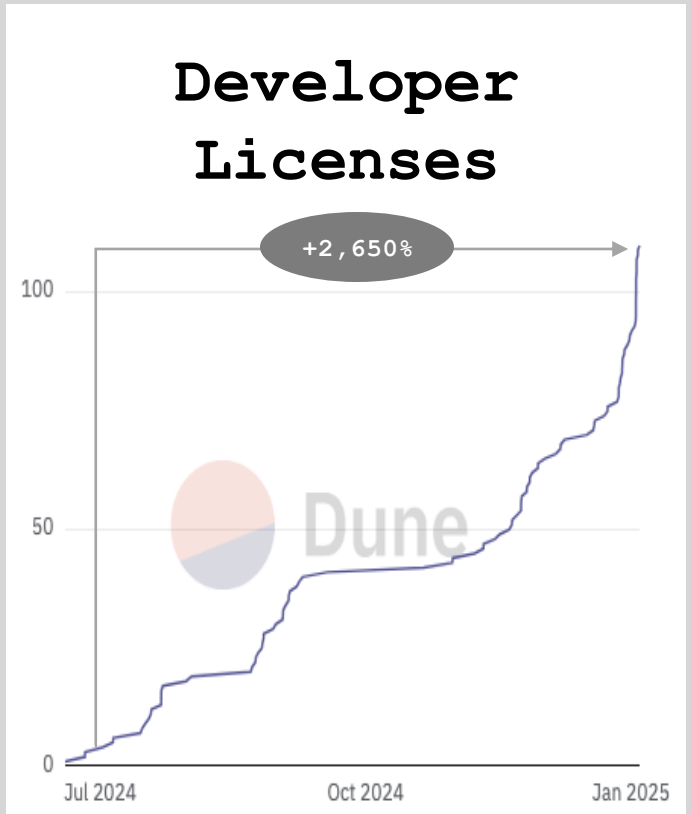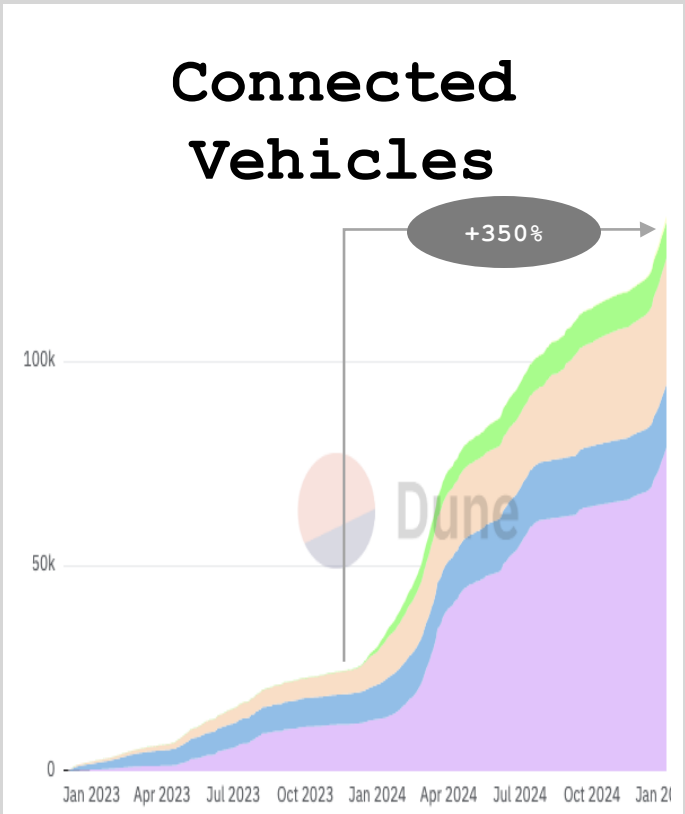
Decentralized loyalty & rewards networks create value through "vertical identity".

Co-founded by Resy founder Ben Leventhal, Blackbird raised $35m from a16z, Multicoin & USV and saw **users check-in to partner restaurants 75k+ times** in the first nine months.

How it Works
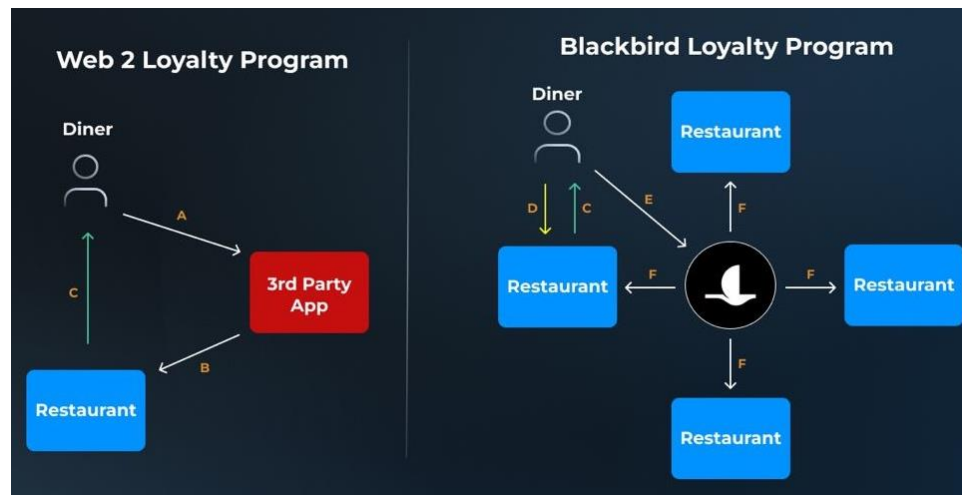
A: Diner provides data to 3rd party app.
B: 3rd party app verifies diner to restaurant.
C: Restaurant rewards diner.
D: Diner checks in to restaurant.
E: Diner provides data to Blackbird network.
F: Blackbird makes diner data available to member restaurants.

Full Messari Report on Blackbird Here

Network Growth

Messari

EV3

Logistics DePINs move people and/or things from one location to another.

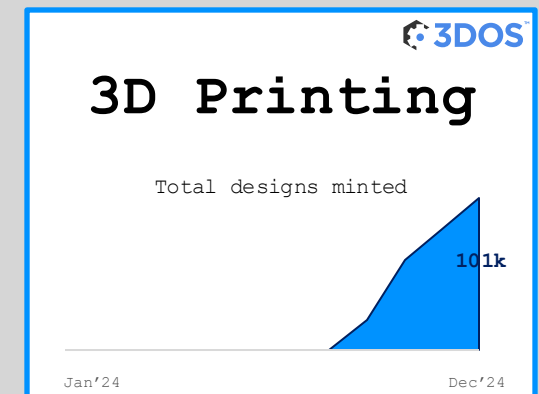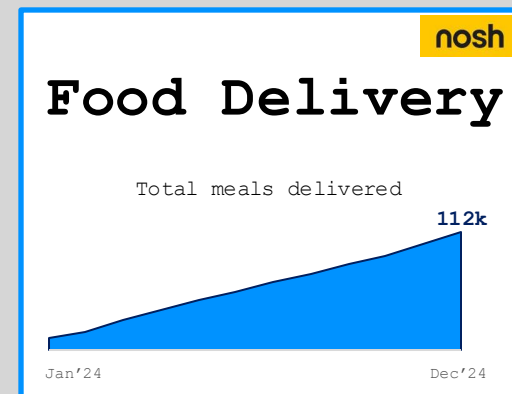Logistics is the **most nascent category of DePIN,** with entrepreneurs experimenting with onchain incentives at every corner of the $5T+ global logistics industry.

Teleport
Ride-sharing
Total rides completed   **1.9k**
Jan'24   Dec'24

Dtravel
Home-sharing
Total room-nights booked   **7.7k**
Jan'24   Dec'24

nosh
Food Delivery
Total meals delivered
112k
Jan'24   Dec'24

3DOS
3D Printing
Total designs minted
101k
Jan'24   Dec'24
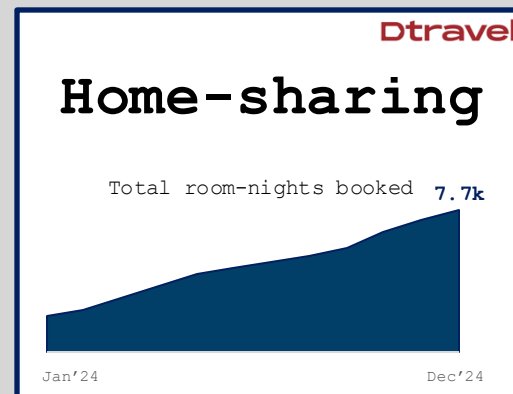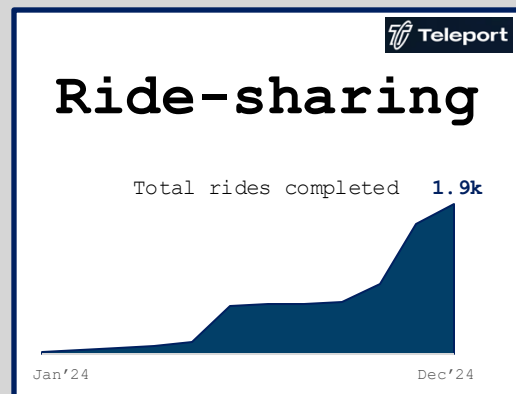
Moving people.   **Moving things.**

MapMetrics
Driver Navigation
Total traffic reports   **110k**
Jan'24   Dec'24

WiFi Map
Pedestrian Navigation
Total amenities mapped   **20k**
Jan'24   Dec'24

HEALE
Trucking & Freight
Total shipments delivered   **1.0k**
Jan'24   Dec'24

MVL
eMobility
Total active scooters/mopeds
920
Jan'24   Dec'24

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EV
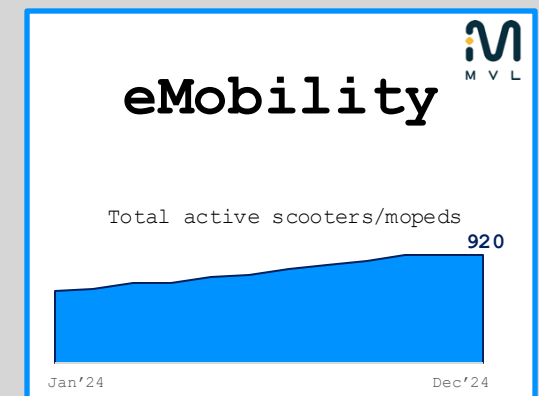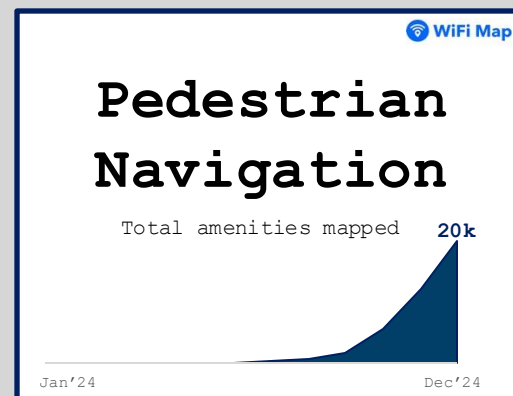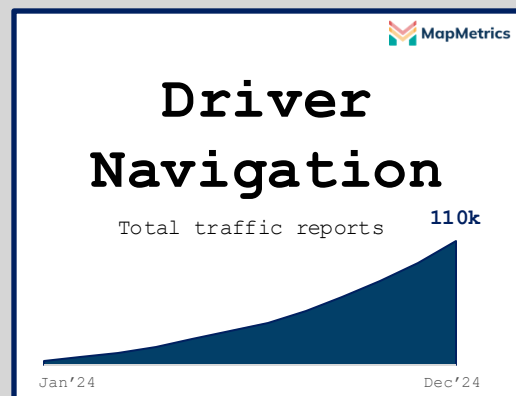
Logistics & finance are already intertwined: DePIN takes <u>financialization</u> one step further.

Digitization has driven value in the logistics supply chain **from _infrastructure_ to _capital_** over the past decade as software platforms embedded native financial products.

Logistics x Financing Opportunities
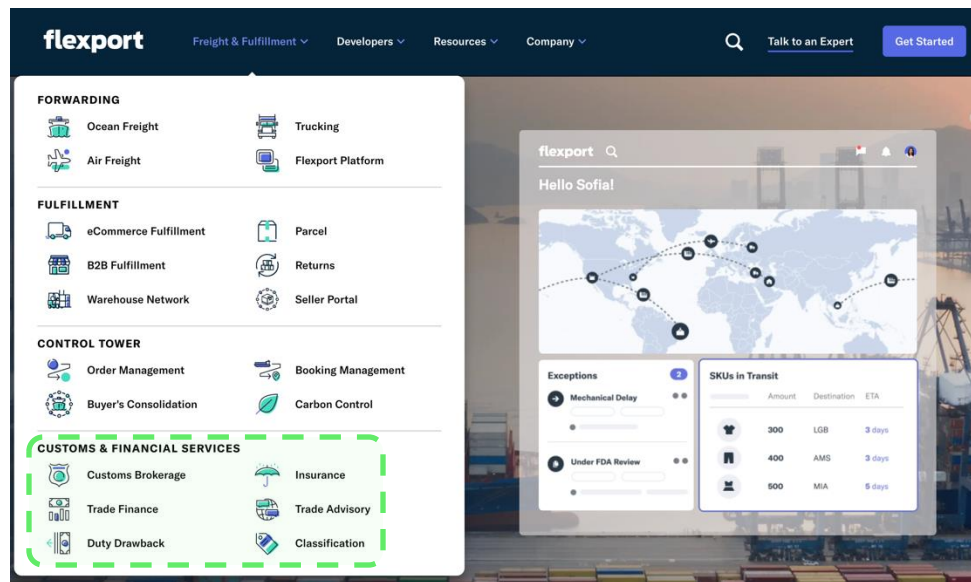
Logistics x Financing Challenges

❌ **Utilization:** 20-35% of truck miles driven are empty shipments.

❌ **Theft:** $35B of cargo gets stolen each year in the US.

❌ **Fraud:** $1B lost annually in payments to fraudulent brokers in the US.

❌ **Settlement:** 6% of freight invoices contain billing errors.

Messari

Logistics DePINs use <u>open hardware & software</u> to track movement more efficiently than web2.

DePINs use **onchain capital to insure real-world activity** by leveraging crypto-graphically verified data from physical sensors & third-party software platforms.

Hardware

Mobile Phones

Teleport

DePINs like Teleport (rideshare) use smartphone geolocation data to validate mobility services rendered by human operators.

Cameras

3DOS

DePINs like 3DOS (manufacturing) use cameras inside 3D printers to validate the quality and timeliness of goods produced.

Trackers

Nodle

DePIN like Nodle (tracking) enable any device with a low-cost BLE tracker to be tracked by nearby Bluetooth-enabled devices, including smartphones.

Software

Relational

nosh

DePINs like Nosh (food delivery) tap into web2 competitors' identity graphs to provide outsized incentives to the most valuable drivers.

Ledgers

Dtravel

DePINs like Dtravel (short-term rentals) tap into web2 incumbents' inventory management software to validate availability & settlement.

zkTLS

Opacity

Networks like Opacity provide the cryptography infrastructure for third-parties to permissionlessly verify user offchain attributes/identities.

3-sided networks are the biggest & most defensible opportunities in logistics.

Three-sided networks tend to dominate the largest global markets, where **onchain capital can be used to provide better financing** for bootstrapping marketplace activity.

Types of Network Effects

	2-sided				3-sided			
	Ridesharing	**Movers**	**Short-term rentals**	**Short-term storage**	**Food delivery**	**Grocery Delivery**	**Manufacturing**	**Freight**
Supply	Drivers	Movers	Residential spaces	Commercial spaces	Restaurants	Grocers	Designers	Carriers
Demand	Riders	Residents	Guests	Travelers	Diners	Consumers	Brands	Shippers
Distributor	--	--	--	--	Drivers	Drivers	Manufacturers	Brokers
Market size	$50B	$20B	$20B	$30B	$100B	$250B	$4T	$1T
Leading DePIN	Teleport	*None yet* Bellhop	Dtravel	*None yet* bounce	nosh	*None yet* instacart	3DOS	HEALE

Messari

Nosh's decentralized <u>food delivery network</u> puts local communities in the driver's seat.

By empowering local restaurants to recruit their own drivers, Nosh has the potential to **increase margins in the food delivery business from $0.50 to $5.00** per order.

Food Delivery Unit Economics

Technology Disruption:

2030+	2027–2029		2025–2027
Additive Food Manufacturing	Robotic Kitchens	Autonomous Vehicles	DePIN

$34.4 — Paid by customer

$7.2 — Cost of ingredients

$7.3 — Cook labor

$9.3 — Driver labor

$4.5 — Platform marketing & admin

$5.6 — Rent

$0.5 — Total margin
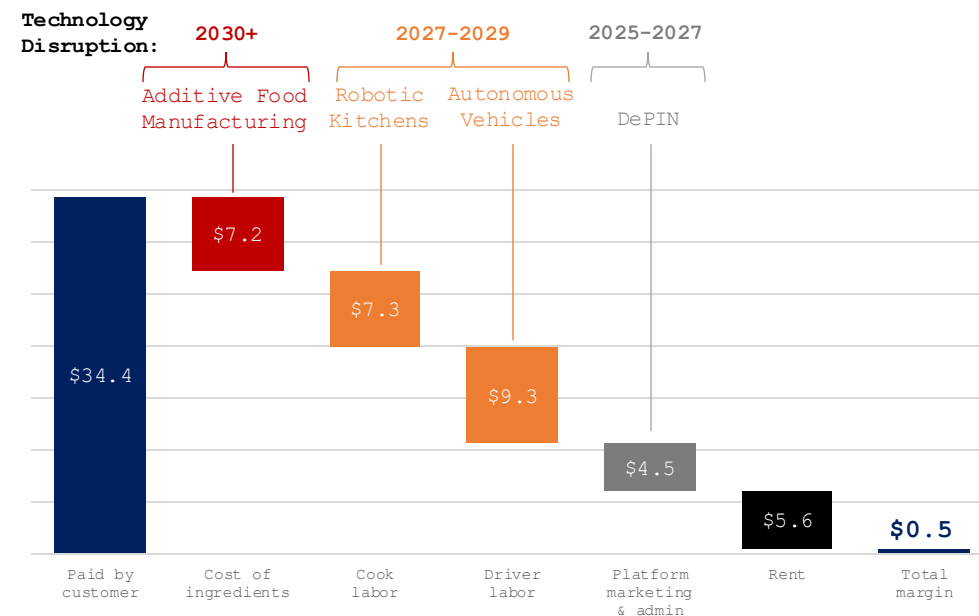
Web2 vs Web3 Comparison

	DOORDASH	nosh
Who recruits drivers & customers?	Global platforms	Local restaurants
Where does settlement happen?	Centralized databases	Public blockchains
How are fees set?	High, variable, opaque	Low, fixed, transparent
Who owns the residual economics?	Shareholders	Restaurants, drivers, customers

Messari

Nosh is powered by LOCAL, the first <u>fully-generalizable DePIN consensus</u> protocol.

Like Google's PageRank algorithm, LOCAL is **agnostic to the nature of economic activity** on the protocol and will therefore eventually expand to every locally-rendered service.

Protocol Mechanics
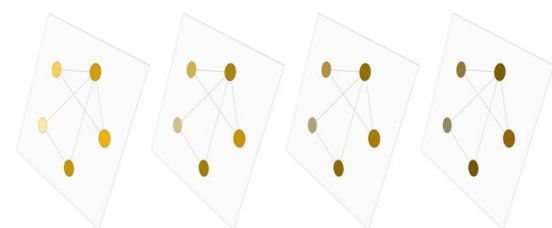
Market participants are represented as nodes in a transaction graph, with edge weights corresponding to the cumulative in-protocol transaction fees between each pair.

Inspired by Google's PageRank algorithm, the protocol distributes $LOCAL rewards to nodes based on their eigenvector centrality, cleverly mitigating sybil & self-dealing attacks that plague DePIN today.
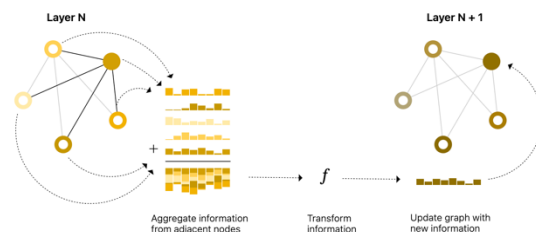
Layer N

Layer N + 1

Aggregate information from adjacent nodes

Transform information

Update graph with new information

Local Services

3DOS is building the missing pillar of e-commerce: <u>on-demand manufacturing</u>.

3DOS utilizes spare capacity on a **network of >75k connected 3D printers** to enable any creator, brand or business to sell custom physical products to their audience.

Ecommerce Stack

shopify
digital **storefront**
$140B market cap

stripe
digital **register**
$70B valuation

Find customers.

Accept payments.

E-commerce Sellers

Build products.

3DOS™
digital **backroom**

3D Printing Use Cases

Custom prosthetics	Sports & fitness gear	Clothing & jewelry	Fixtures & furniture
Car, plane & drone parts	Robotics prototyping	Precision farming	Costumes & movie props

3DOS™
US coverage map

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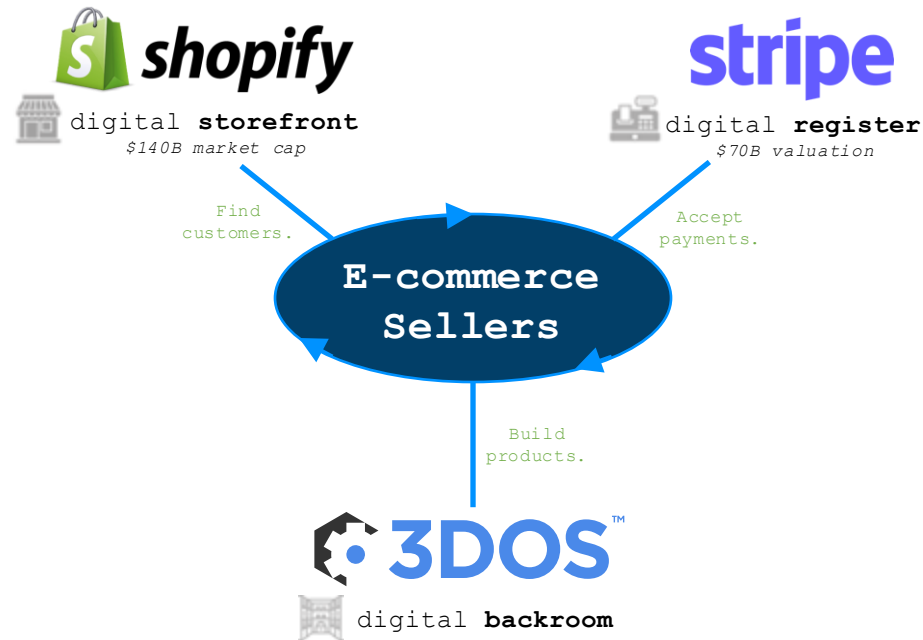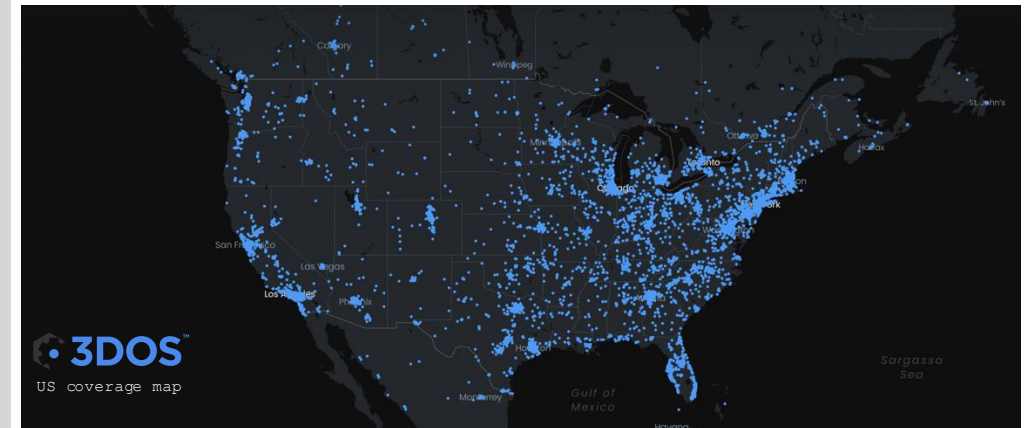
The future of e-commerce is hyper-personalization enabled by 3D printing.

3D printers have gotten **orders of magnitude cheaper**, **faster & better** and are now capable of generating high-quality, custom-built consumer & industrial goods on-demand.

Consumer 3D Printer Specs

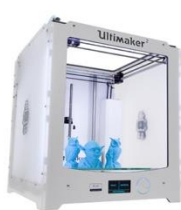|	2014	2024	
Cost per machine	$2,500	$700	**4x+ cheaper**
Cost per part	$10-20	$1-5	
Printing speed	50 mm/s	500 mm/s	**10x+ faster**
Calibration time	20 mins manual	2 mins automatic	
Print resolution	20 microns	10 microns	**2x+ versatile**
Supported materials	2 PLA/ABS	5 PLA/ABS/PETG/TPU/Carbon Fiber	

Ultimaker 2   *Bambu P1P*

Types of Manufacturing

	Subtractive manufacturing	Formative manufacturing	Additive manufacturing
Tech	**CNC machining:** cuts a solid block of material down into desired shape.	**Molding/casting:** fill a mold with molten material & allow it to dry into desired shape.	**3D printing:** place thin layers of material on top of each other into desired shape.
Pros	**Industrial parts** for products that need precision & strong mechanical properties.	**Large-scale production** for products that need low per-unit costs at massive scale.	**On-demand products** & rapid proto-typing that needs max design flexibility.
Cons	Waste from discarded materials; expensive & difficult-to-operate equipment required.	Up-front time & cost to create molds; limited ability to create complex shapes.	Slow for large-scale production; limited to certain types of materials.

3D Printing enables on-demand manufacturing.

Heale's logistics network connects the massively fragmented <u>freight industry</u>.

With $1T in annual gross revenues, the **US freight industry has massive demand for verifiable data** that can make aggregation & settlement processes more efficient.

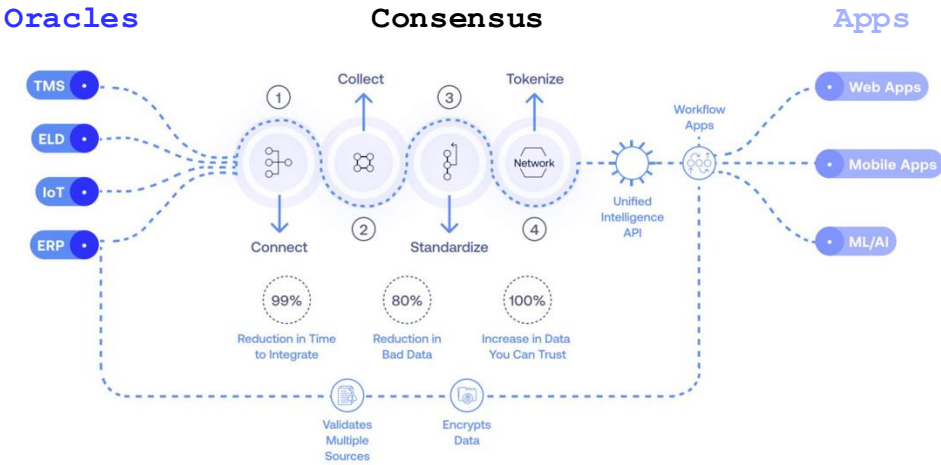## Freight Unit Economics

Freight carriers make $25 of top-line revenues and $1.5 of bottom-line profit on every 10 miles of delivery.

Technology Disruption:

| | Autonomous Trucks | Electric Trucks | DeFi | DePIN |

Waterfall chart values:
- Paid by customer: $25.0
- Driver labor: $6.5
- Fuel: $4.7
- Financing: $3.6
- Marketing & admin: $3.8
- Fixed overhead: $4.9
- Total margin: **$1.5**
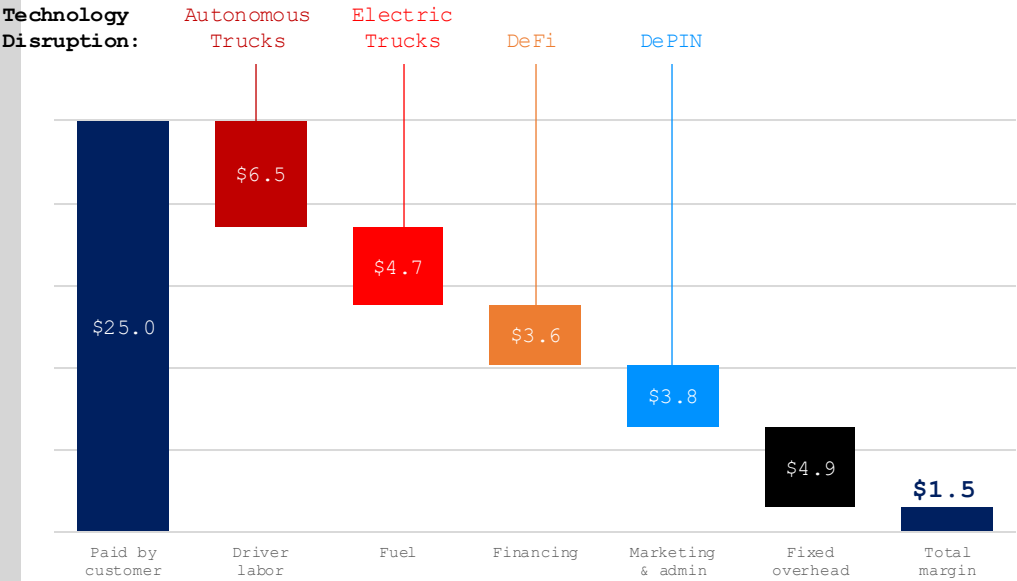
Heale Protocol

Heale ingests logistics data to achieve crypto-economic consensus on the state of real-world shipments; then uses its resulting data & liquidity to enables an ecosystem of useful apps for carriers, shippers and brokers.

Oracles — **Consensus** — **Apps**

Oracles: TMS, ELD, IoT, ERP

Consensus:
1. Collect
2. Connect
3. Standardize / Tokenize
4. Network
- 99% Reduction in Time to Integrate
- 80% Reduction in Bad Data
- 100% Increase in Data You Can Trust
- Validates Multiple Sources
- Encrypts Data
- Unified Intelligence API
- Workflow Apps

Apps: Web Apps, Mobile Apps, ML/AI

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Dtravel facilitates short-term rentals between strangers around the world.

Dtravel's tokenization protocol gives hosts end-to-end control over their listing, regardless of which platform consumers use to make the booking.
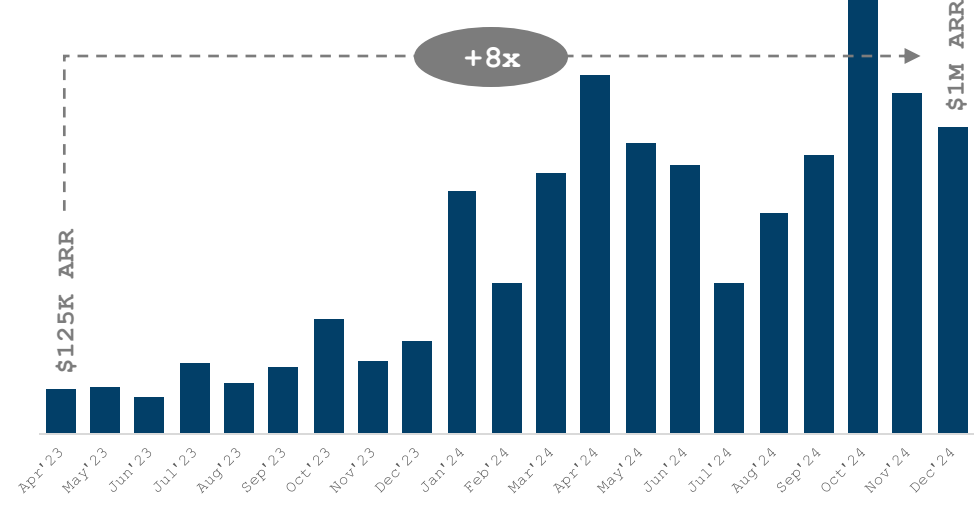
How it Works

Dtravel tokenizes short-term rental bookings on the Nite protocol, enabling permissionless 3rd-party frontends & native integration with Base's onchain finance (DeFi) ecosystem.
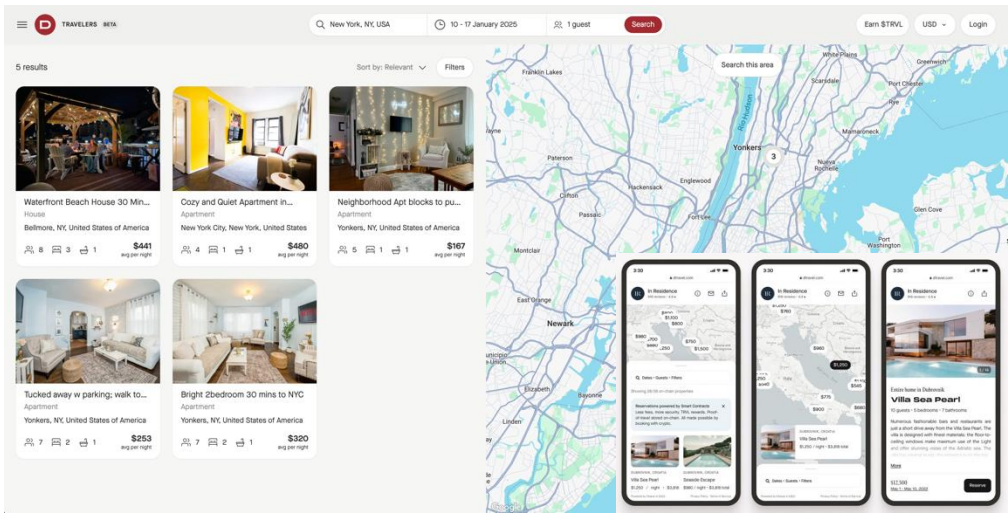
Revenue Growth

In less than two years since launch, Dtravel's booking platform has grown by >8x to over a million dollars in annualized gross revenues.

Teleport (logo, top left)

EV³ (top right)

Teleport is disrupting the <u>ride-sharing industry</u> starting with Austin, Texas.

With ridesharing platforms like Uber taking **up to 45% of fares**, both riders & drivers are hungry for ridesharing networks that put their interests first.

How it Works

Teleport tokenizes ride-shares on the <u>TRIP protocol</u>, enabling permissionless 3rd-party frontends & native integration with Solana's onchain finance (DeFi) ecosystem.
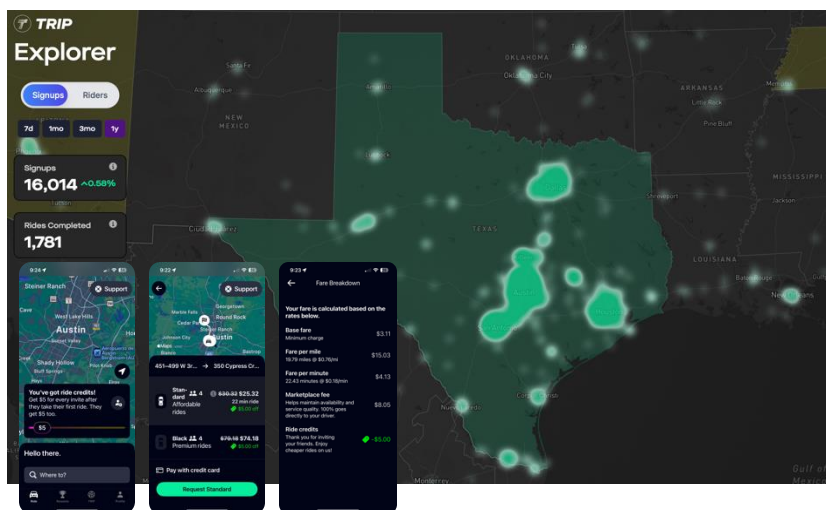
Network Growth

In the first two quarters post-launch, Teleport's booking platform has grown by >10x to over fifty thousand dollars in annualized gross revenues.

+10x

$5K ARR $55K ARR

Jul'24 Aug'24 Sep'24 Oct'24 Nov'24 Dec'24

Messari (logo, bottom right)
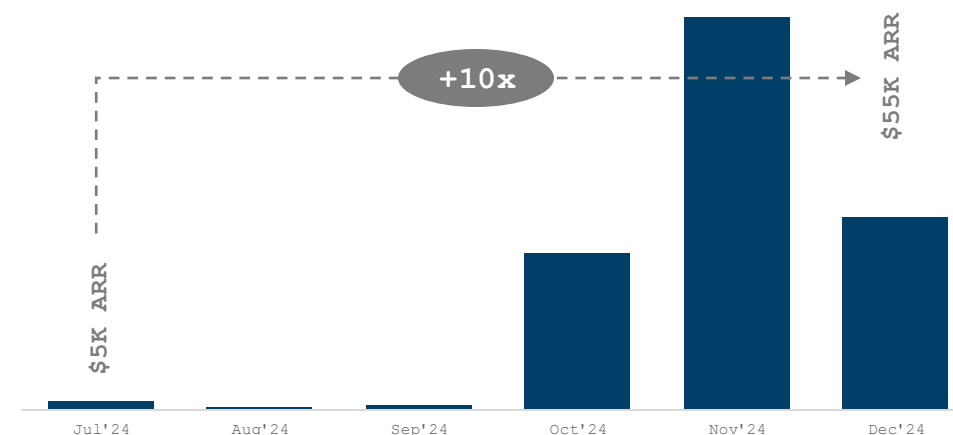
There are several unexplored billion-dollar DePIN logistics opportunities remaining.

Looking to web2 startups for inspiration, there is demand for **new forms of logistics networks bootstrapped by novel use cases** like luggage storage & short-term staffing.
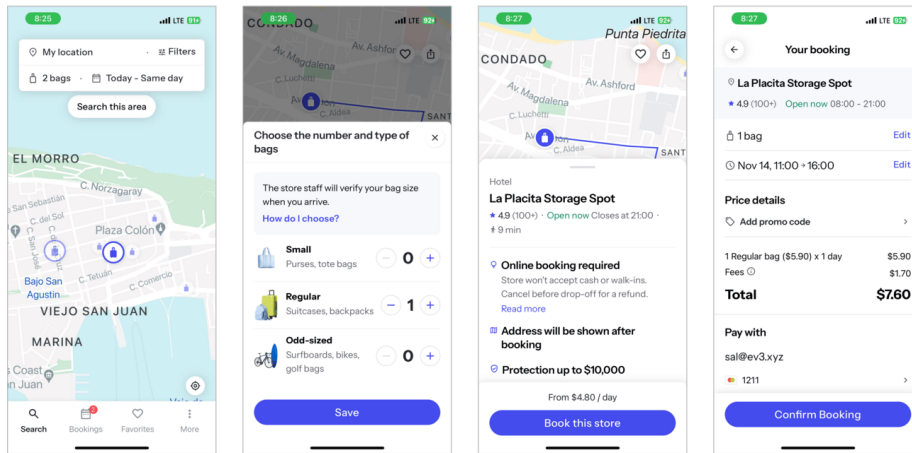
Luggage Storage

bounce

Bounce connects travelers with local shops to store their luggage for the day, backed by a $5k insurance-like policy.

Bounce has grown by >750x over the past four years and is currently available at 13k+ locations worldwide.

Backed by a16z & General Catalyst.

Staffing

Timee

Timee is a Japanese on-demand staffing startup for the hospitality, retail, events, nursing, childcare and manufacturing sectors.

Grew net revenues +67% in 2024 up to ~$170m ARR, with only 1 million of Japan's 7-10 million gig workers onboarded onto the platform.

Raised $350m in Japan's largest IPO of 2024, currently valued at $1B.

Messari

DePIN is an inevitable global movement.

If you made it this far, you might just be crazy enough to join us in the trenches:

- Chat with EV3 about a DePIN thesis or potential investment: founders@ev3.xyz

- Apply to join the EV3 team and help write next year's State of DePIN: team@ev3.xyz

- Apply to join the Messari team: messari.io/careers.

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